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This part contains accounts of the investigation of the biodiversity of Flordon Common carried out by members of the Society one hundred years after the publication of the paper by WH Burrell and WG Clarke describing the flora and fauna of the Common. The Presidential Address and other papers commence on page 117

The Norfolk & Norwich Naturalists' Society has as a principal aim the investigation and recording of Norfolk's wildlife and to this end it publishes:

- An annual volume of *Transactions*, consisting of papers and notes on wildlife in the county.
- The *Norfolk Bird and Mammal Report* which contains systematic lists of observations on the county's birds and mammals, as well as relevant articles.
- *The Norfolk Natterjack*, a quarterly illustrated newsletter.

All of these publications are free to members, as are *Occasional Publications* on specific topics.

The Society also arranges lectures and field meetings which are planned to appeal to anyone interested in natural history. More specialist groups cover many aspects of the county's flora and fauna.

The subscription rate is £15 per year, which includes all members of a family living at the same address. Group affiliation is available at £15 per year.

Membership enquiries should be made to: Mike Stew, All other enquiries should be directed to the Secretary, Dorothy Cheyne, Wood House, Free Lane, Ditchingham, Bungay NR25 2DW. Tel 01986 894277.

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Introduction to Flordon Common

Bob Ellis

In September 1910, WH Burrell and WG Clarke read a paper to the Norfolk and Norwich Naturalists' Society on the flora and fauna of Flordon Common, based on a "careful study ... at all seasons of the year" during 1908 and 1909. They suggested that the study "... while not without interest to present day [1910] naturalists, it might in view of the changes mentioned [becoming drier and less wild and inaccessible], have a greater value for our successors as a record of a typical 'wet common' early in the twentieth century". Burrell and Clarke's coverage of vascular plants, mosses and liverworts and charophytes was exhaustive but their survey of the fauna was confined to mammals, birds, reptiles, amphibians and molluscs.

Members of the Research Group of the present day Society undertook to carry out a survey of the Common after a one hundred year interlude to enable comparisons to be drawn and to extend the coverage to include fungi, lichens and as many groups of invertebrates as possible. The time-span of the present day study was somewhat longer (approximately seven years rather than two, though most intensively conducted during 2008 and 2009) and considerably more naturalists were involved. Information was also drawn from other sources such as a visit in 2003 by the British Bryological Society and surveys commissioned by the Environment Agency as well as data supplied by the Norfolk Biodiversity Information Service. The results of this modern study are presented here as a series of articles and where no systematic survey was undertaken for particular groups of invertebrates, some short notes and species lists.

Flordon Common is situated in the valley of a small tributary of the River Tas some twelve kilometres south-south-west of Norwich, centred at grid reference TM181972. In total, it comprises almost 14 hectares, of which just over ten are designated as a Site of Special Scientific Interest (SSSI). The Common may be considered as two portions. To the west of the road to Hapton, named 'Norwich Road' on modern maps, is a narrow strip of land bordered to the south in part by the stream and at the eastern end by a ditch. This area of c. 2.4 hectares does not fall within the SSSI and is referred to in this report as the Western Common although it also sometime known locally as the 'Further Common'. The Eastern Common includes the two compartments of the SSSI and at the easternmost end an area of c. 1.4 hectares is divided from the SSSI by a large ditch and is, in part, a village amenity area. A public footpath runs the length of the Western Common along its northern edge and another follows the southern edge of the Eastern Common.

The Common has survived to this day as an area of great natural history interest, probably because it was very wet common land of little agricultural value and yet had been kept open by grazing and by cutting, both for hay and for sedge and rush litter. In the 1950s and 60s, the commoners' rights were vigorously defended by Ida Holmes and an attempt to drain the Common was abandoned (see Janet Negal's article on the history of the Common).

Although the Common has been extensively grazed up to the present day, in recent years woodland encroachment appears to have accelerated. The map in Burrell and Clarke's 1910 article shows little

or no woodland at all (see the reprint of Burrell and Clarke, 1910, on page 96). The 1946 aerial photograph (page 17) shows small areas of woodland in the south-east corner of the Western Common (there are a few hybrid poplar trees here so this may be partly plantation) and in one part of the southern boundary of the Eastern Common, along with a small area of scrub on the north-eastern edge. The modern aerial photograph (page 17) graphically illustrates the present extent of the alder woodland in the southern part of the Eastern Common (see photograph page 18). The scrub at the north-eastern edge has been joined by small patches in the central area. The alder is encroaching on some of the most important areas of habitat and although some clearance is carried out, with such a large area of adjacent woodland, continued invasion of the wetter parts of the site is inevitable and regular clearance will be necessary if it is to be held at bay.

The Western Common underwent changes in the 1950s. Burrell and Clarke described "thickets of furze" but in an article in the Eastern Daily Press in 1952 Ted Ellis noted that: "The western part ... appears to have been cleared fairly recently by bulldozer. In place of the gorse, bramble and thorn thicket, which used to cover much of this piece, there is now a long patch of gently sloping land ..." (Ellis 1952). Presently, this area is occasionally cut to control the scrub (P Aspinall pers. comm.). Much of the grass here is quite tall and rank and there are only a very few gorse bushes (see photograph page 18). The small piece of marsh that Burrell and Clarke described is now largely covered with trees, although areas of reed and tall herbs are still present. The parish pit discussed by Burrell and Clarke appears to have been more extensively worked after 1946 (as shown by later aerial photographs) and then filled in and has become part of the arable field. A cliff can be seen well to the north of the footpath, presumably at the northern edge of this later working, and a

small remnant of the pit lies just to the west of the boundary of the Common as shown on modern maps.

The hydrology of the Common has also undergone changes and this is discussed in Peter Lambley's article. It is possible that the most dramatic change took place between 1910 and 1924 – annotations on the proofs of the 1910 article by WG Clarke (Clarke 1924) note that the stream had been cleaned out and had drained much of the standing water on the Common. The Common is certainly drier now than it was in 1910: Burrell and Clarke described numerous pools where now there are few; they note "... practically no grass growing on the marsh ... the foundation of the marsh floor being moss, principally *Hypnum cuspidatum* [*Calliergonella cuspidata*] and *Hypnum molluscum* [*Ctenidium molluscum*]" and, other than in a few small areas, this is no longer the case. In an article in 1922 Clarke described six springs "... which bubble up with considerable force, and keep the surrounding sand constantly in motion" and where still present, these are now mostly little more than seepages (Clarke 1922).

Perhaps the most important plant community present is the *Schoenus nigricans*-*Juncus subnodulosus* mire, National Vegetation Classification (NVC) community M13. In Britain, this is widespread in the lowlands but very locally distributed and one of the M13 sub-communities is primarily found in small, isolated sites in East Anglia (Rodwell 1991). At Flordon, this mire community occurs towards the south-western end of the open fen on the Eastern Common. It is the great diversity of habitats and micro-habitats in close proximity to one another, however, that is probably most significant for the wide range of invertebrates present.

The Common was designated as a SSSI in 1959, primarily as a good example of a lowland calcareous spring-fed fen and it is part of the Norfolk Valley Fens SAC (Special Area of Conservation). The Narrow-

mouthed Whorl Snail *Vertigo angustior* is mentioned in the SSSI citation and this tiny snail still thrives on the Common, recorded by Roy Baker and Derek Howlett (see their paper on the molluscs). The present survey has listed five more 'red data book' species of invertebrate and a further twenty-five that are nationally scarce. A nationally scarce fungus has been added to the inventory and the Common still supports three flowering plants on the vascular plant red data list and two that are nationally scarce. Of the birds that breed on the Common, three are on the red list and eight on the amber list. Seven of the mammals that use the Common, including four species of bat, are designated as Biodiversity Action Plan priority species. Let us hope that this small remnant of Norfolk's early twentieth century 'wet commons' continues to be cherished as the unique treasure that it undoubtedly still is.

Acknowledgements

In 1989 a report on the history of the Flordon Common was commissioned by Ron Robinson and written by Geoffrey Kelly. This has been an invaluable reference and source of documentary evidence for this study. An extract from this report is reprinted on page 103. We would like to thank Norfolk Landscape Archaeology (Norfolk Rural Life Museum, Gressenhall) for their kind assistance with researching historical aerial photographs and we are very grateful to the Norfolk Biodiversity Information Service for their generous financial support for this publication.

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RW Ellis 11 Havelock Road, Norwich NR2 3HQ

Flordon Common

Hydrogeology

Peter Lambley

Flordon Common is a constituent site in the Norfolk Valley Fens SAC (Special Area of Conservation) and as such has been subjected to a Review of Consents as required by the Habitats Directive Regulations to ascertain whether there any impacts from water abstraction on the site. As a consequence there have been a series of investigations funded by the Environment Agency to understand the geology and hydrogeology of this and the other sites included in the Norfolk Valley Fens SAC. This account is based on that work (Entec 2004).

Geology

The site lies in the valley of a tributary of the River Tas. This stream has cut through the surrounding boulder clay deposits into the underlying sands and gravels; these occupy the valley floor and sides. Near the stream in the middle of the valley are recent peat and alluvium deposits overlying these deposits. Underlying the sands and gravels is the Upper Chalk within the Upper Senonian stage. In places it comes within two metres or less of the surface. Investigative boreholes put down by the Environment Agency show the following sequence:

Peaty top soil: ground level to 1.0 m below ground level.

Loose sand and gravel: 1.0 m - 2.2 m below ground level.

Upper chalk: 2.2 m below ground level.

Hydrogeology

The erosion has lowered the ground surface so that it is close to the regional groundwater surface within the chalk. Groundwater is therefore close to the surface over much of the site. The chalk groundwater flow

towards the fen emerges via the sands and gravels as springs and seepages along the upper section of the valley slopes in the northern part of the Fen.

The site is therefore essentially a groundwater discharge zone, with the fen being maintained by water flowing from the chalk through the sands and gravels on the valley sides into the fen. The near-surface groundwater levels within the fen appear to be controlled predominately by water levels in the ditch drainage system. Other inputs will come from rain but as the catchment is small c. 0.5 km² this is not likely to be significant.

Drainage history

Shaw (2009) has detailed the drainage history as known from a number of accounts. Burrell & Clarke (1910) cite anecdotal evidence that the site was wetter in the 19th century than at the time of their survey. The references to open water by Burrell & Clarke may reflect peat cuttings rather than a higher water table. Though there is no certain evidence that this was the case, the gentle, irregular topography of the fen may reflect these past practices. By 1910 there were several drainage ditches within the marsh, though these were largely closed in, and the site was drier.

By 1924 there had apparently been “a considerable alteration in the Flora. The stream was then cleaned out and runs with a very rapid current and this seems to have drained a good deal of the standing water. The pools in which the *Utricularia* and *Chara* once flourished have vanished and I was unable to find any *Drosera* on either common, though not prepared to say none is present” (Clarke, 1924).

By 1956 the Common had “been intersected by 4 long drains 3 – 4 ft deep and probably 6 ft. across. [These were apparently dug in 1954, though as there is reference to several drainage ditches as early as 1911 they may be re-excavations of these earlier ditches.] These run longitudinally parallel with the stream.” [anon (? B Ducker) note, 11th January 1956]. However, even in 1958 parts of the site were still treacherous with Common Bladderwort *Utricularia vulgaris* in small pools between the Black Bog-rush *Schoenus nigricans* tussocks, and the ditches were becoming colonised by fen plants including Bog Pimpernel *Anagallis tenella* and Butterwort *Pinguicula vulgaris*, although there was vigorous growth of Ash *Fraxinus excelsior* in some drier places. (B Ducker, unpublished report, 1958). When Francis Rose visited the site in 1960 he found Great Sundew *Drosera anglica*, implying that some parts were still very wet or perhaps had re-wetted.

Shaw (2009) suggests that it is no drier now than when visited by Bryan Wheeler in 1972, however some of the key species of the NVC Community M13 (*Schoenus nigricans* – *Juncus subnodulosus* mire) appear to be less frequent than then. This may in part reflect less grazing or other changes in management. Other species indicative of wet conditions have been refound recently including Tall Thyme-moss *Plagiomnium elatum* (last recorded 1972), Delicate Germanderwort *Riccardia multifida* (not recorded since 1910) both in 2009. Fen Pondweed *Potamogeton coloratus*, new to the site, was found in 2008.

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PW Lambley The Cottage, Elsing Road,
Lyng, Norfolk NR9 5RR

A brief history of Flordon Common

Janet Negal

We have evidence that people have been using Flordon Common for thousands of years. Burrell and Clarke (1910) refer to Neolithic flint implements there and as recently as 2009 an Early or Middle Bronze Age (2350-1000BC) flint scraper was found.

Flordon Common is not mentioned in the Domesday Book, although this mainly wet uncultivated area must have existed then. The first mention of it comes in the earliest surviving Glebe Terrier for Flordon in 1613 which refers to the Common and implies that at an earlier unspecified time it extended further down the valley in which it now lies (Kelly 1989).

The area was certainly known to 19th century naturalists. In Volume 2 of the *Transactions of the Norfolk and Norwich Naturalists' Society*, F Kitton mentions Flordon in a list of sites for diatoms (Kitton 1877) and in Volume 4 there is a list of plants found on the Common by HD Geldart and HG Glasspoole in August 1885 (Geldart 1885). Members of the Norwich Science Gossip Club made an excursion to the Common by wagonette in May 1899. Ten years later, Burrell and Clarke visited the Common regularly over two years, culminating in their detailed report in 1910.

When, on 23rd January 1954, the *Eastern*



Ida Holmes on the Common with some of her livestock, 1973.

Daily Press carried the headline 'Naturalists' Haunt at Flordon Being Drained for Cultivation', all who valued this precious and well-documented wildlife habitat were greatly concerned. Flordon Parish Council had assumed an overall responsibility for the Common, had put the land out to tender and authorized drainage work to be carried out. Deep ditches had already been dug as a preliminary to more intensive agricultural reclamation when the work was halted as the result of an inquiry held by Norfolk County Council. Fortunately, these drainage ditches appeared to make little permanent difference to the flora because the area is fed by several springs.

When Ida Holmes (the fourth generation of her family to live next to the Common and the granddaughter of the Mrs Potter referred to by Burrell and Clarke) found her common rights being compromised, she took legal action. After a twelve year legal wrangle, culminating in 1966 in a case before the County Court in Norwich, she finally won her battle. This meant that those with commoners' rights were free to exercise them and Flordon Common would not be put to the plough.

In 1959 the Common became a Site of Special Scientific Interest (SSSI). A reason for its notification at that time was that it was considered to be one of the best examples of a calcareous spring-fed fen (rare in Britain) to be found in Norfolk. Mention was also made of a rare species of mollusc, Narrow-mouthed Whorl Snail *Vertigo angustior*. Flordon Common is now one of the component SSSIs of the Norfolk Valley Fens Special Area of Conservation. SACs are areas given special protection under the European Union's habitat directive.

In the legal sense, the term 'common' refers to the rights held in common by certain people over a piece of land and not the ownership of the land which normally rests with a single person, such as the Lord of the Manor (Cartwright 1988). Ownership

of Flordon Common had never been established but a claim to it was made in 1979. In April of that year, the Commons Commissioner held an enquiry and concluded that no person was the owner. It therefore remains subject to protection under Section 9 of the Commons Registration Act 1965. This states that any local authority in whose area the land is situated may take steps to protect it from unlawful interference in the same way that an owner would.

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J Negal 'Inishmore', Greenways, Newton Flotman, Norfolk NR15 1QJ

Vascular plants

Bob Ellis

The scope of the recent survey

The vascular plants of Flordon Common SSSI, the strip of common to the west of Hapton Road (the Western Common) and the grassland to the extreme north-east of the Common, which does not form part of the SSSI, were surveyed between 2008 and 2010. This corresponds as closely as possible with the area studied by Burrell and Clarke in 1908 and 1909. Species recorded during visits by the Norfolk and Norwich Naturalists' Society and Norfolk Flora Group in May, June and August 2003 were also included as were recent observations from Pat and Janet Negal, and Peter Aspinnall, who visit the site regularly. In total, 324 vascular plant taxa were recorded, a number similar to the 309 listed by Burrell and Clarke in 1910¹. A few additional records from the surveys by the University of Sheffield: Wheeler & Shaw (2007) and Shaw (2008) have also been taken into account as well as two species recorded for the 1993 NVC survey which were not seen later.

Some notable species

The Common is still a very productive place botanically, partly due to the range of habitats present but also because some of these habitats are particularly species-rich in themselves. As with other Norfolk valley fens, many plants on the SSSI are characteristic of *Schoenus nigricans*-*Juncus subnodulosus* mire (NVC community M13) including Bog Pimpernel *Anagallis tenella* (see photo p.19), Lesser Tussock-sedge *Carex diandra*, Tawny Sedge *Carex hostiana*, Flea Sedge *Carex pulicaris*, Long-stalked Yellow-sedge *Carex viridula* subsp. *brachyrrhyncha*,

Narrow-leaved Marsh-Orchid *Dactylorhiza traunsteineri*, Marsh Helleborine *Epipactis palustris* (see photo p.19), Broad-leaved Cotton-grass *Eriophorum latifolium*, the Eyebright *Euphrasia pseudokernerii*, Fragrant Orchid *Gymnadenia conopsea*, Twayblade *Listera ovata*, Butterwort *Pinguicula vulgaris*, Fen Pondweed *Potamogeton coloratus* and Black Bog-rush *Schoenus nigricans*. Of these, Butterwort, Broad-leaved Cottongrass and Lesser Tussock-sedge appear to be present only in very small quantities and Butterwort was only seen in 2003 and not in 2008-2010. Grass-of-Parnassus *Parnassia palustris* and Marsh Lousewort *Pedicularis palustris* were not seen in 2008-2010 but were recorded by Wheeler & Shaw in 2007.

Flat-sedge *Blysmus compressus* was first found on the Common in 2008 by Arthur Copping, along both edges of the shallow northern ditch. It was quite plentiful towards the western end and a further small colony was found in 2009 towards the eastern end of the same ditch (see photo p.19). Its apparent absence in earlier years is hard to explain. Brookweed *Samolus valerandi* is another intriguing addition to the list.

A number of species associated with calcareous grassland occur on patches of slightly higher ground within the fen and these include Fairy Flax *Linum catharticum* and Common Milkwort *Polygala vulgaris*. Notable species in drier grassland elsewhere include Harebell *Campanula rotundifolia*, Spring-sedge *Carex caryophyllea*, Hoary Plantain *Plantago media*, Hoary Cinquefoil *Potentilla argentea*, Meadow Saxifrage *Saxifraga granulata*, Bird's-foot Clover *Trifolium ornithopodioides* and Knotted Clover *Trifolium striatum*.

¹ Burrell and Clarke seem to have included the two charophytes in their total of 311.

Near the track to the north of the fen, it was interesting to note that a group of species often associated with rural habitation, some possibly related to the keeping of livestock, are still present after 100 years. These include Good King Henry *Chenopodium bonus-henricus*, Dwarf Mallow *Malva neglecta*, Cotton Thistle *Onopordum acanthium* and Vervain *Verbena officinalis*.

Changes in the composition of the flora

In order to be able to compare the vascular plants recorded in 1910 with those of the present day, we need to understand any nomenclatural changes in the intervening years (see Table 3). Hopefully this list will also act as an aid to those wishing to study Burrell and Clarke's original paper.

Furthermore, a number of other taxa need to be aggregated or excluded if the changes are to be analysed. It is not safe to assume that where Burrell and Clarke recorded the species that they would also have recorded the segregate, even if equivalent names were available at the time. These exclusions and aggregates are as follows:

Dactylorhiza traunsteineri was not separated from *Orchis latifolia* and it is unlikely that the hybrid marsh-orchids would have been distinguished; *Euphrasia nemorosa* and *E. pseudokernerii* were not differentiated from *Euphrasia officinalis* by Burrell and Clarke and the genus *Euphrasia* has been revised since; *Luzula multiflora* may have been included under *L. campestris*; *Phleum bertolonii* was known as *P. pratense* var. *nodosum* but may not have been differentiated; *Poa humilis* was known as *Poa pratensis* var. *subcaerulea* but may not have been differentiated; *Stellaria neglecta* and *S. pallida* were not separated from *S. media* and *Veronica catenata* was not separated from *V. anagallis-aquatica*. Whether or not Burrell and Clarke would have distinguished between *Carex diandra* (then *C. teretiuscula*) and *Carex paniculata* or between *Eriophorum latifolium* and *E. angustifolium* is moot. Although they are listed under the modern names in Nichol-

son (1914) (without mention of Flordon Common), not all authors of the time included them as separate taxa and it seems rather unlikely that they would have been absent in 1910 yet present now – so they have also been excluded from the analysis.

Another caveat is that the perception of the boundaries between the three habitat groups that Burrell and Clarke described are likely to be somewhat different between the surveys. It should also be noted that with no indication of abundance, all species carry the same weight even if they were only represented by a single stray specimen.

All that said, it is still a wonderful opportunity to make a comparison. Figures 1 and 2 illustrate the differences between species counts across the habitat groups as described by Burrell and Clarke, i.e. 'Water', 'Marsh' and 'Higher Ground'.

The majority of the species found by Burrell and Clarke are still present on the Common today and in total, the number of additions and the number of losses are very similar (Figure 1, column 1). It is clear that the greatest number of species and the greatest turnover both occur in the Higher Ground habitats. As Burrell and Clarke point out,

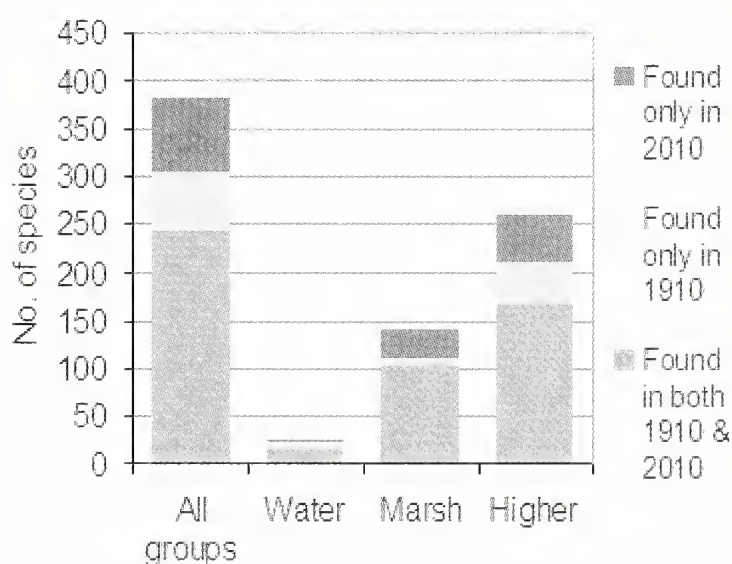


Figure 1. Turnover as number of species. Note that the sum of the totals for individual habitat groups will exceed the total of the 'All groups' column since several species occur in two of the groups.

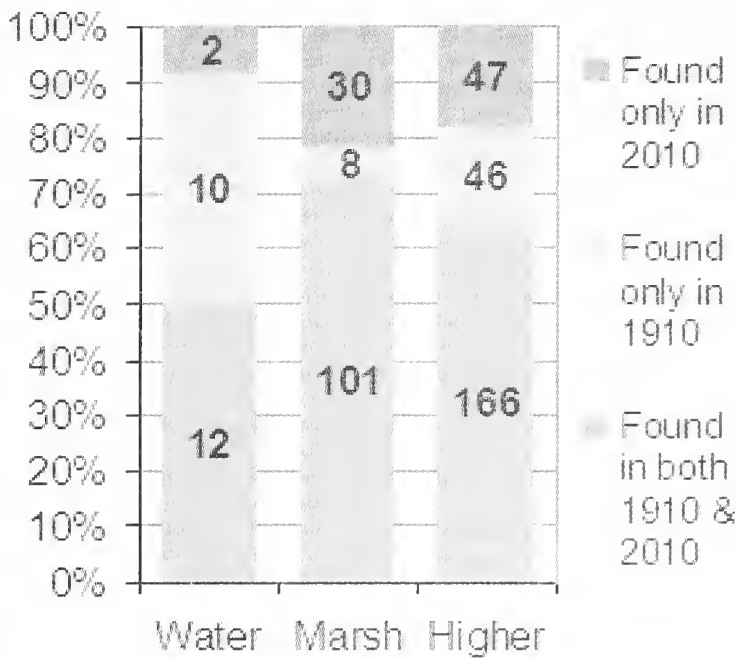


Figure 2. Turnover as a percentage within each habitat group.

the larger numbers are mainly due to the diversity of habitats within the group. It also includes parts of the Common that have undergone some substantial physical changes, such as the bulldozing of the scrub on the western common. The Marsh group shows the greatest stability, with only 8 losses from 109, whereas the Water group shows the greatest relative loss of species with almost half of those present in 1910 apparently lost since.

Ellenberg indicator values

Heinz Ellenberg, a German ecologist, defined scales of ecological indicator values for plant species. For example, Nitrogen (N) is an indicator of preference for soil fertility and ranges from extremely infertile (1) to

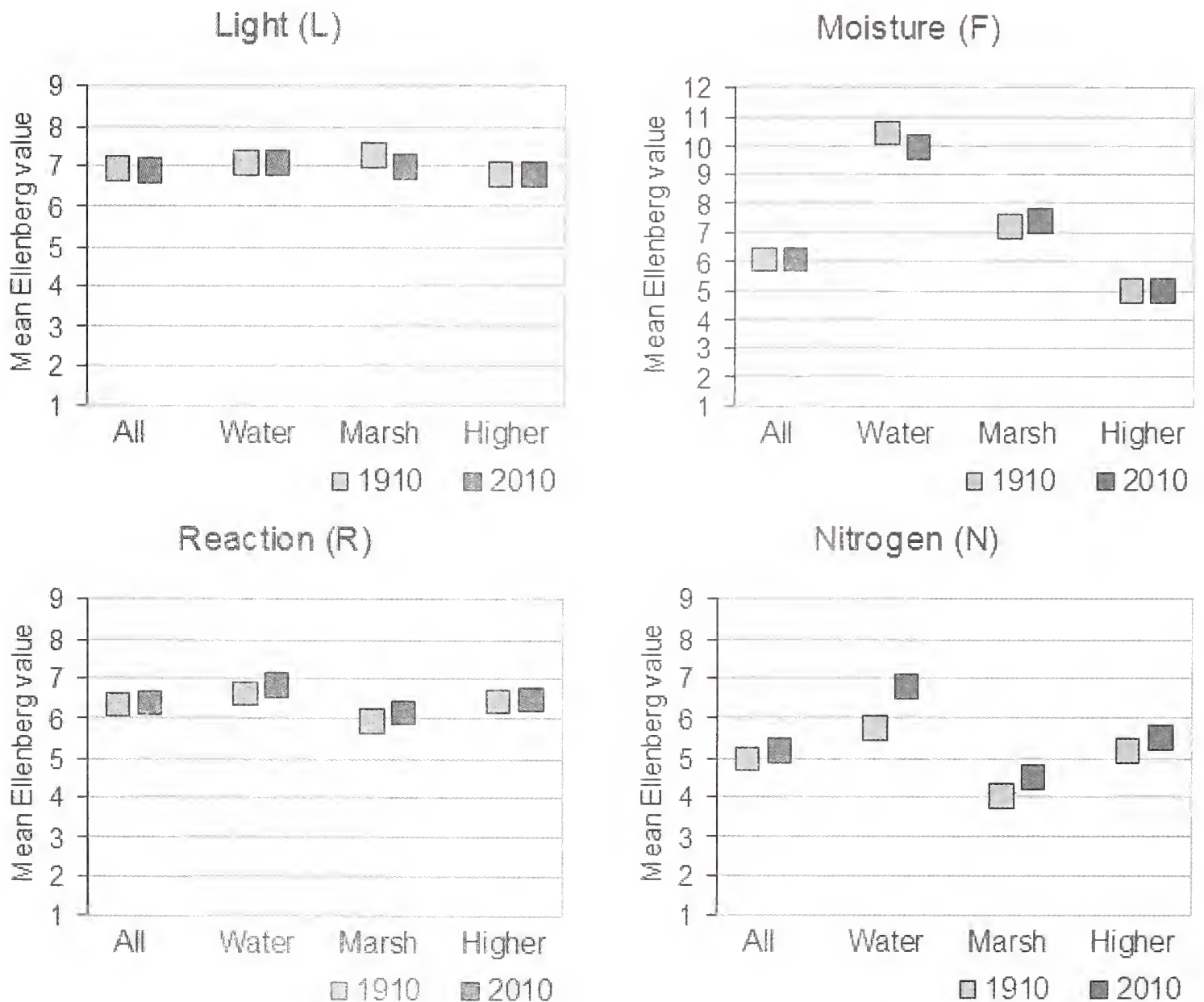


Figure 3. Ellenberg values compared between 1910 and 2010 by habitat group. The full Ellenberg scale is shown on these diagrams to allow the mean values to be put into context within the possible range.

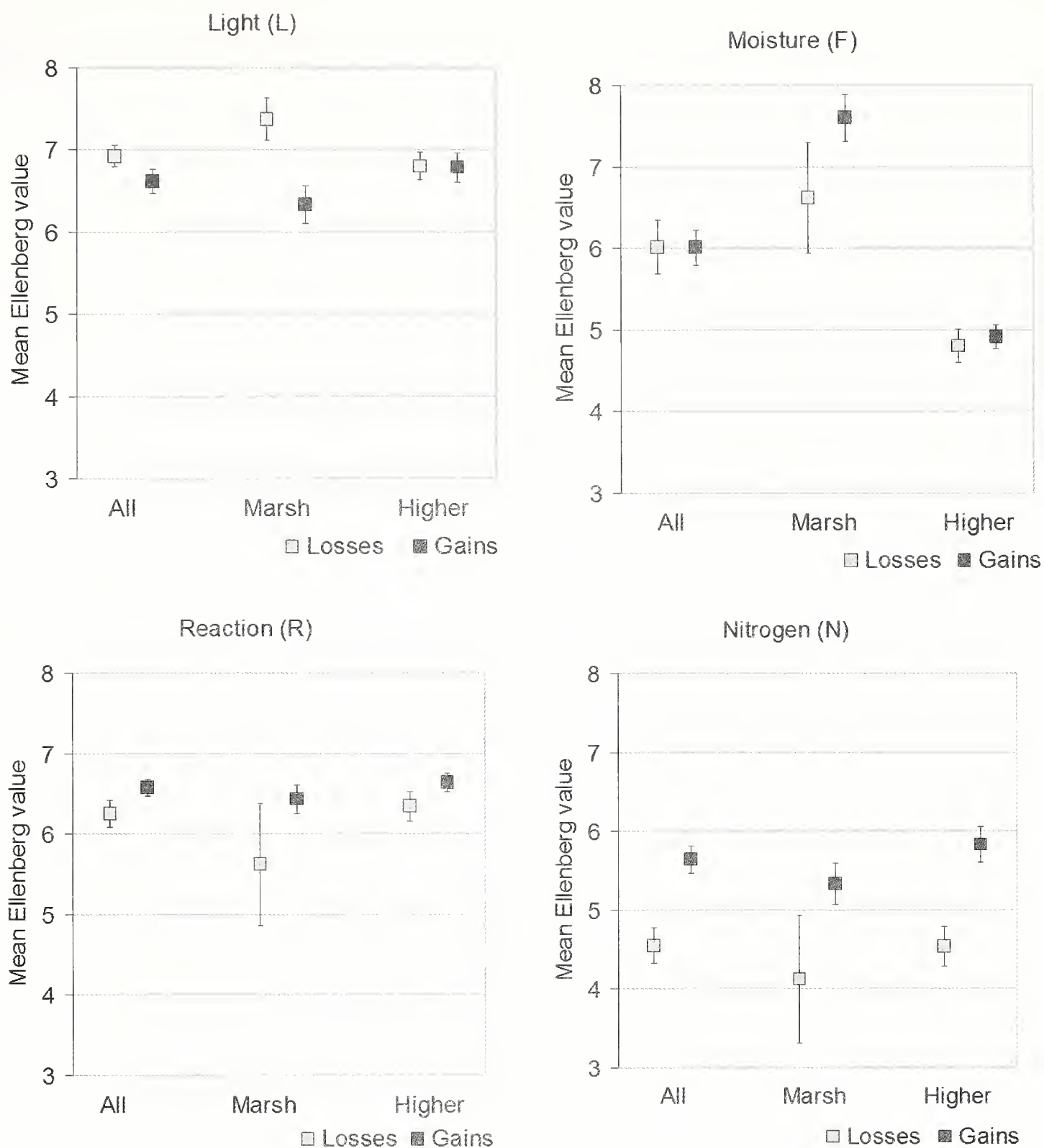


Figure 4. Mean Ellenberg values of the losses and gains. The error bars indicate \pm one standard error of each mean.

extremely rich (9) conditions. Three further indicators are considered here: Light (L) ranges from deep shade (1) to full light (9); Moisture (F) from extreme dryness (1) to fully submerged (12) and Reaction (R) from extreme acidity (1) to very basic (9). For further details see Hill *et al.* (2004).

All species

Figure 3 shows mean Ellenberg values for the species listed by Burrell and Clarke (1910) compared with those in the present

survey (2010). In all habitat groups combined (column 1) there is an increase in species with a preference for higher fertility which is statistically significant ($p < 0.1$). Within each habitat group this significance is even greater ($p < 0.05$ in each case). Within the Marsh group there is a clear trend towards species with a preference for shadier conditions ($p < 0.05$)

Losses and gains

The lists of species lost and gained be-

tween the surveys can each be considered as a subset of the full list and their mean Ellenberg values can also be compared. The Water group is excluded because it only gained two species (though the species in the group are still included in the 'all groups' comparison). The results are shown in Figure 4.

The trend towards species with a preference for higher nutrient levels is even more marked when considering gains against losses ($p < 0.001$ across all groups and for Higher Ground). The trend towards species with a preference for greater shade is somewhat more significant for Marsh ($p < 0.01$) and a trend for a more alkaline soil reaction is apparent when considering all habitat groups ($p < 0.1$).

Scarce and threatened species

Several scarce and threatened species were present on the Common between 2003 and 2010 and these are listed in Table 1. Two of them, perhaps need some further clarification.

A form of Eyebright *Euphrasia pseudokernerii* (forma *elongata*) was described by Pugsley (1930) from Norfolk material and Swann (1973) described this form as "abundant on Flordon Common". Much of the tall late-flowering *Euphrasia* with long internodes growing in the fen is almost certainly this taxon. Plants that are shorter in stature and

that flower somewhat earlier, particularly on the slightly raised calcareous areas, are most probably *E. nemorosa* and it is likely that hybrids between the two are present.

Narrow-leaved Marsh-orchid *Dactylorhiza traunsteineri* hybridises freely with Southern Marsh-orchid *Dactylorhiza praetermissa*. With subsequent introgression, many intermediates can arise and specimens that clearly display all the characteristics of the true Narrow-leaved Marsh-orchid may only occur occasionally – this seems to be the case at Flordon Common.

All the species in Table 1 were present on the SSSI. Flat-sedge and Fen Pondweed are probably new to the Common. Lesser Tussock-sedge and Broad-leaved Cottongrass were probably present in 1910 but not recorded (but there is no way to be sure).

Table 2 lists scarce and threatened species that were present in Burrell and Clarke's time, which have not been recorded recently. Burrell and Clarke noted Great Sundew in the marsh and it can be inferred that it was in the area encompassed by the SSSI. It was present in 1955 when EA (Ted) Ellis made a list of the species on the Common but he did not record it on a similar list made in 1974 (from annotations on a copy of Burrell and Clarke's paper). It is also clear from Burrell and Clarke's text that the Lesser Bladderwort was also on

Table 1. Scarce and threatened species present on Flordon Common 2003-2010. EN=Endangered, VU=Vulnerable, NT=Near Threatened, NS=Nationally Scarce, LS=Locally Scarce

Species	English name	Red List	Scarcity	BAP priority
<i>Euphrasia pseudokernerii</i>	An eyebright	EN	NS	Yes
<i>Blysmus compressus</i>	Flat-sedge	VU	LS	Yes
<i>Chenopodium bonus-henricus</i>	Good-King-Henry	VU	-	-
<i>Carex diandra</i>	Lesser Tussock-sedge	NT	-	-
<i>Filago vulgaris</i>	Common Cudweed	NT	-	-
<i>Dactylorhiza traunsteineri</i>	Narrow-leaved Marsh-orchid	-	NS	-
<i>Potamogeton coloratus</i>	Fen Pondweed	-	NS	-
<i>Eriophorum latifolium</i>	Broad-leaved Cottongrass	-	LS	-
<i>Pinguicula vulgaris</i>	Common Butterwort	-	LS	-

Table 2. Scarce and threatened species present on Flordon Common in 1910 but not listed in the recent survey. EN=Endangered, VU=Vulnerable, NT=Near Threatened, NS=Nationally Scarce, LS=Locally Scarce

Species	Vernacular name	Red List	Scarcity	BAP priority
<i>Scleranthus annuus</i>	Annual Knawel	EN	NS	Yes
<i>Clinopodium acinos</i>	Basil Thyme	VU	LS	Yes
<i>Nepeta cataria</i>	Cat-mint	VU	-	-
<i>Oenanthe fistulosa</i>	Tubular Water-dropwort	VU	-	Yes
<i>Baldellia ranunculoides</i>	Floating Water-plantain	NT	-	-
<i>Drosera anglica</i>	Great Sundew	NT	NS	-
<i>Utricularia minor</i>	Lesser Bladderwort	-	LS	-

this part of the Common. The others do not receive particular attention so it is not clear whether they were in the SSSI area or not, although Tubular Water-dropwort and Floating Water-plantain are most likely to have been in the pools in the fen. It is possible that Annual Knawel was lost when the gravel pit was filled in, as has been the case at several other Norfolk sites.

Natives and non-natives

As well as being distinguished from native species, non-native taxa can be divided into two groups 'archaeophytes' and 'neophytes', the latter having become established at a later date. Preston *et al.* (2004) applied the concept of 'archaeophytes' to the British flora. The concept is widely used in Europe and defines an archaeophyte as a non-native species that became established before AD 1500. Of course, due to lack of evidence, the status of some species remains uncertain. Figure 5 illustrates the relative proportions of these classifications in the losses and gains at Flordon Common. It can be seen that the bulk of the species are native; that the number neophytes has increased proportionally, and archaeophytes have declined slightly.

Conclusions

The composition of the flora of the fen areas, particularly the *Schoenus nigricans*-*Juncus subnodulosus* mire and the *Juncus subnodulosus*-*Cirsium palustre* fen-meadow has changed remarkably little over a period of

a hundred years. Sadly, Great Sundew and the bladderworts are no longer present. The fact that so few plants of Broad-leaved Cottongrass and Lesser Tussock-sedge were seen in 2009 and that Butterwort, Grass-of-Parnassus and Marsh Lousewort were not seen at all on the most recent visits is also of great concern. Butterwort in particular seems to be declining in Norfolk; it is now in very small quantities at many of its valley fen sites and has recently disappeared from Buxton Heath.

The analysis of Ellenberg values provides evidence of an increase in nutrient levels over the period. A trend towards plants more tolerant of shade is undoubtedly associated with the encroachment of wood-

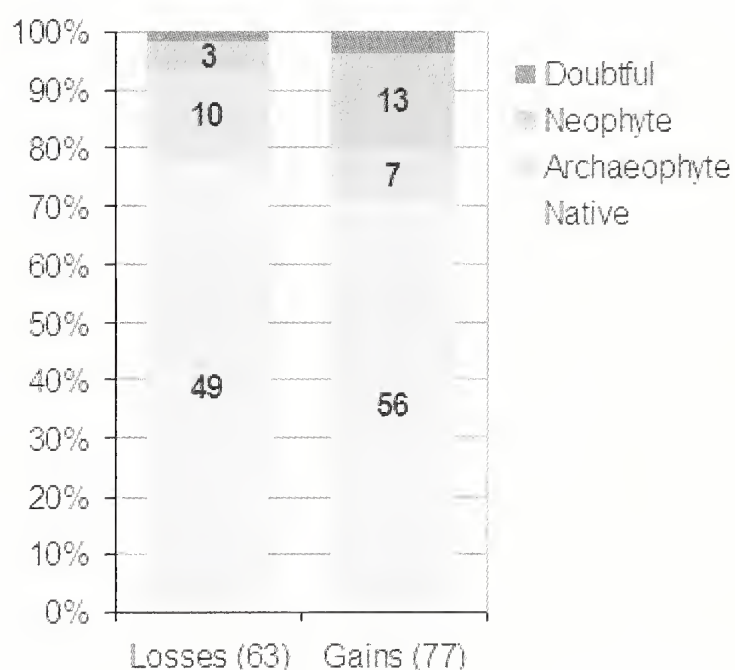


Figure 5. Relative proportions of natives, archaeophytes and neophytes in the species lost and gained.

land. Changes in hydrology and grazing are also probable contributory factors to the changes in balance of species present.

The loss of species in the Water habitat group can also partly be explained by shading. The beck which forms the southern boundary of much of the Common only supported one species in Burrell and Clarke's time, Horned Pondweed *Zannichellia palustris*. In 2010 the only species seen in the beck itself was a small amount of Water Starwort *Callitriche* sp. where the water pools behind a recently built sluice and the beck is now shaded for most of its length. Burrell and Clarke also describe a ditch on the western common "full of rank vegetation in summer". This ditch is still present but it too is shaded for much of its length and where the light does penetrate much of it is choked with Common Reed *Phragmites australis*. Most of the species in this group that have been lost, however, would have been in pools on the fen and it is the decline of these pools that is probably the main cause.

The greatest changes have occurred in the 'Higher Ground' and here there is very strong evidence of a trend towards species with a preference for more fertile soils. Eutrophication allows more aggressive species to displace ones that are adapted to survive in more demanding conditions but are less competitive. This matches a countrywide trend. Analysis of the Countryside Surveys that were carried out in 1978 and 1990, concluded that inputs of nitrogen and other nutrients, both from the air and from agriculture, were one of the most important drivers of vegetation change in recent years (Firbank *et al.* 2000). The proportionate increase in neophytes is also in line with countrywide trends. Between the two periods 1930-1969 and 1987-1999, 56 of the 100 species that showed the greatest relative increase in range were neophytes including nine of the top ten (Preston *et al.* 2002).

The range of vascular plant species present

at Flordon Common is still quite outstanding and compares favourably with many of the best sites in the county. Despite some worrying trends, the Common remains a haven of botanical delight.

Acknowledgements

I would like to thank Peter Aspinall and Pat and Janet Negal for facilitating the surveys of the Common and Kevin Walker, Peter Lambley and Mary Ghullam for checking and commenting on the manuscript and for their useful suggestions.

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RW Ellis 11 Havelock Road, Norwich NR2 3HQ

Table 3. Changes in nomenclature since Burrell & Clarke (1910)

Burrell & Clarke (1910)	Stace 2nd ed. (1997)	English name	Note
<i>Agropyron repens</i>	<i>Elytrigia repens</i>	Common Couch	
<i>Agrostis tenuis</i>	<i>Agrostis capillaris</i>	Common Bent	
<i>Alchemilla arvensis</i>	<i>Aphanes arvensis</i>	Parsley-piert	
<i>Alisma ranunculoides</i>	<i>Baldellia ranunculoides</i>	Lesser Water-plantain	
<i>Alnus rotundifolia</i>	<i>Alnus glutinosa</i>	Alder	
<i>Anthriscus vulgaris</i>	<i>Anthriscus caucalis</i>	Bur Chervil	
<i>Arenaria trinervia</i>	<i>Moehringia trinervia</i>	Three-nerved Sandwort	
<i>Atriplex hastata</i>	<i>Atriplex prostrata</i>	Spear-leaved Orache	
<i>Bartsia odontites</i>	<i>Odontites vernus</i>	Red Bartsia	
<i>Brassica arvensis</i>	<i>Sinapis arvensis</i>	Charlock	
<i>Bromus sterilis</i>	<i>Anisantha sterilis</i>	Barren Brome	
<i>Calamintha acinos</i>	<i>Clinopodium acinos</i>	Basil Thyme	
<i>Carex flava</i>	<i>Carex viridula</i>	Yellow-sedge	1
<i>Carex goodenowii</i>	<i>Carex nigra</i>	Common Sedge	
<i>Carex inflata</i>	<i>Carex rostrata</i>	Bottle Sedge	
<i>Carex vulpina</i>	<i>Carex otrubae</i>	False Fox-sedge	2
<i>Caucalis anthriscus</i>	<i>Torilis japonica</i>	Upright Hedge-parsley	
<i>Centaurium umbellatum</i>	<i>Centaurium erythraea</i>	Common Centaury	
<i>Cerastium viscosum</i>	<i>Cerastium glomeratum</i>	Sticky Mouse-ear	
<i>Cerastium vulgatum</i>	<i>Cerastium fontanum</i>	Common Mouse-ear	
<i>Chrysanthemum leucanthemum</i>	<i>Leucanthemum vulgare</i>	Oxeye Daisy	
<i>Cnicus acaulis</i>	<i>Cirsium acaule</i>	Dwarf Thistle	
<i>Cnicus arvensis</i>	<i>Cirsium arvense</i>	Creeping Thistle	
<i>Cnicus lanceolatus</i>	<i>Cirsium vulgare</i>	Spear Thistle	
<i>Cnicus palustris</i>	<i>Cirsium palustre</i>	Marsh Thistle	
<i>Crataegus oxyacantha</i>	<i>Crataegus monogyna</i>	Hawthorn	
<i>Equisetum limosum</i>	<i>Equisetum fluviatile</i>	Water Horsetail	
<i>Festuca elatior</i>	<i>Festuca pratensis</i>	Meadow Fescue	
<i>Festuca rigida</i>	<i>Catapodium rigidum</i>	Fern-grass	
<i>Filago germanica</i>	<i>Filago vulgaris</i>	Common Cudweed	
<i>Glyceria aquatica</i>	<i>Glyceria maxima</i>	Reed Sweet-grass	
<i>Habenaria conopsea</i>	<i>Gymnadenia conopsea</i>	Fragrant Orchid	
<i>Helleborine longifolia</i>	<i>Epipactis palustris</i>	Marsh Helleborine	
<i>Hieracium pilosella</i>	<i>Pilosella officinarum</i>	Mouse-ear-hawkweed	
<i>Hordeum nodosum</i>	<i>Hordeum secalinum</i>	Meadow Barley	
<i>Hypericum quadrangulum</i>	<i>Hypericum tetrapterum</i>	Square-stalked St John's-wort	
<i>Juncus sylvaticus</i>	<i>Juncus acutiflorus</i>	Sharp-flowered Rush	
<i>Lastrea filix-mas</i>	<i>Dryopteris filix-mas</i>	Male-fern	
<i>Lotus uliginosus</i>	<i>Lotus pedunculatus</i>	Greater Bird's-foot-trefoil	
<i>Lychnis alba</i>	<i>Silene latifolia</i>	White Campion	
<i>Lychnis dioica</i>	<i>Silene dioica</i>	Red Campion	
<i>Malva rotundifolia</i>	<i>Malva neglecta</i>	Dwarf Mallow	
<i>Matricaria inodora</i>	<i>Tripleurospermum inodorum</i>	Scentless Mayweed	
<i>Mentha longifolia</i>	<i>Mentha spicata</i>	Spear Mint	3
<i>Myosotis collina</i>	<i>Myosotis ramosissima</i>	Early Forget-me-not	
<i>Myosotis versicolor</i>	<i>Myosotis discolor</i>	Changing Forget-me-not	
<i>Nepeta hederacea</i>	<i>Glechoma hederacea</i>	Ground-ivy	

Burrell & Clarke (1910)	Stace 2nd ed. (1997)	English name	Note
<i>Orchis incarnuata</i>	<i>Dactylorhiza incarnata</i>	Early Marsh-orchid	
<i>Orchis latifolia</i>	<i>Dactylorhiza praetermissa</i>	Southern Marsh-orchid	
<i>Orchis maculata</i>	<i>Dactylorhiza fuchsii</i>	Common Spotted-orchid	4
<i>Polygonum convolvulus</i>	<i>Fallopia convolvulus</i>	Black-bindweed	
<i>Polygonum persicaria</i>	<i>Persicaria maculosa</i>	Redshank	
<i>Potentilla procumbens</i>	<i>Potentilla anglica</i>	Trailing Tormentil	5
<i>Pteris aquilina</i>	<i>Pteridium aquilinum</i>	Bracken	
<i>Pyrus malus</i>	<i>Malus domestica</i>	Apple	
<i>Radicula nasturtium-aquaticum</i>	<i>Rorippa nasturtium-aquaticum</i>	Water-cress	
<i>Ribes grossularia</i>	<i>Ribes uva-crispa</i>	Gooseberry	
<i>Rosa eglanteria</i>	<i>Rosa rubiginosa</i>	Sweet-briar	
<i>Rubus corylifolius</i>	<i>Rubus</i> section <i>Corylifolia</i>	A bramble	
<i>Rubus rusticanus</i>	<i>Rubus ulmifolius</i>	A bramble	
<i>Scabiosa succisa</i>	<i>Succisa pratensis</i>	Devil's-bit Scabious	
<i>Scrophularia aquatica</i>	<i>Scrophularia auriculata</i>	Water Figwort	
<i>Sisymbrium thalianum</i>	<i>Arabidopsis thaliana</i>	Thale Cress	
<i>Sium erectum</i>	<i>Berula erecta</i>	Lesser Water-parsnip	
<i>Spiraea ulmaria</i>	<i>Filipendula ulmaria</i>	Meadowsweet	
<i>Stellaria aquatica</i>	<i>Myosoton aquaticum</i>	Water Chickweed	
<i>Thymus serpyllum</i>	<i>Thymus pulegioides</i>	Large Thyme	6
<i>Tilia vulgaris</i>	<i>Tilia x europaea</i>	Lime	
<i>Trifolium filiforme</i>	<i>Trifolium micranthum</i>	Slender Trefoil	
<i>Trifolium procumbens</i>	<i>Trifolium campestre</i>	Hop Trefoil	
<i>Ulmus campestris</i>	<i>Ulmus procera</i>	English Elm	

1 This almost certainly refers to *Carex viridula* subsp. *brachyrrhyncha*.

2 This is not *Carex vulpina* L. as it is currently understood, which does not occur in Norfolk. *C. otrubae* was not separated at the time.

3 Stace (1997) states that pubescent variants of *Mentha spicata* L. were misidentified in the past as *M. longifolia* (L.) Huds. and does not list the latter as a British plant.

4 As *Orchis maculata* was understood at the time it would have included both *Dactylorhiza fuchsii* (Druce) Soó and *D. maculata* (L.) Soó.

5 It is more likely that this actually refers to *Potentilla erecta*, which is frequent in the fen but only listed for the higher ground in Burrell & Clarke (1910). Nicholson (1914), the publication of which both Burrell and Clarke were closely involved with, describes *P. procumbens* as "Apparently rare. Hedgebanks etc." with only three localities. Flordon is not mentioned, whereas many of the other species in Burrell and Clarke's paper are specifically listed.

6 This could refer to either *Thymus pulegioides* or *T. polytrichus*; the former is the more widespread taxon in Norfolk. The genus *Thymus* has been much revised in the intervening years and *T. serpyllum* L. now refers only to the very scarce Breckland Thyme.

Vascular Plants continues on page25

Aerial photographs of Flordon Common



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The following pages present a selection of images to accompany the special feature on Flordon Common. Some taxa are rare, some are common, but all have an association with the Common. It should be noted, however, that many of these images were not captured at Flordon, and thus should not be taken as supporting documentation.



Above: A view of the Eastern Common showing the Alder woodland and encroachment onto the fen. Below: A view of the Western Common showing coarse grassland, now very different to the 1910 description by Burrell and Clarke. Photos: Janet Negal.





Clockwise: Bog Pimpernel. Photo: Janet Negal; Flat-Sedge. Photo: Janet Negal; Great Sundew (present in 1910 but not recorded recently) Photo: Simon Harrap; Marsh Helleborine. Photo: Peter Aspinall.



Mosses and liverworts

Left: *Moerckia flotoviana*. Photo: Colin Dunster.

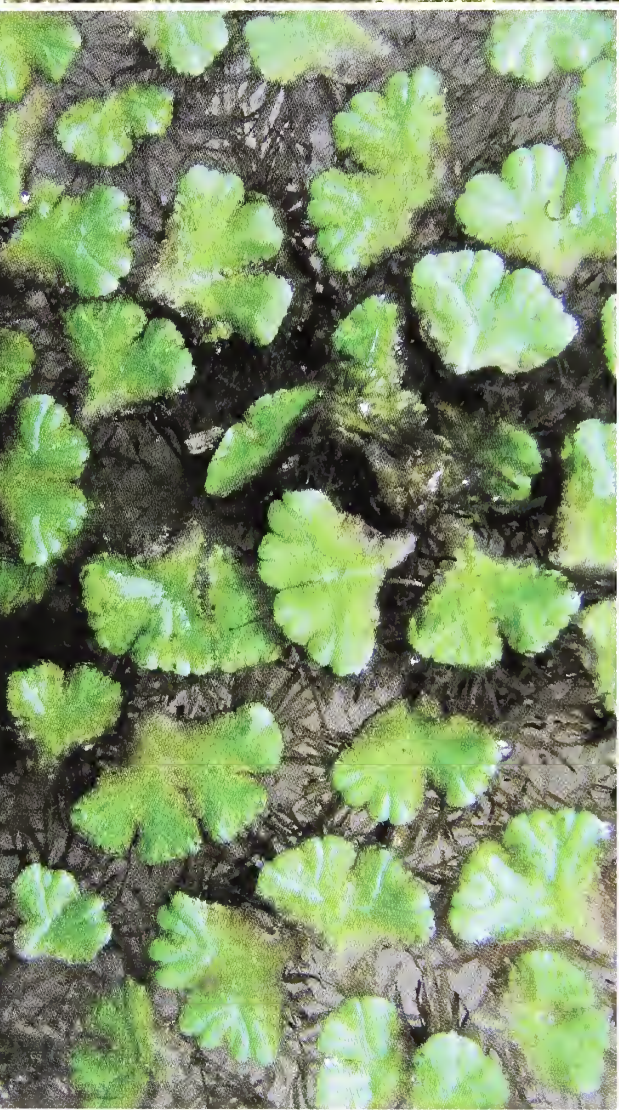


Centre left: *Ricciocarpos natans* Fringed Heartwort. Not recorded recently at Flordon. Photo: Robin Stevenson;

Top right: *Cryphaea heteromalla* Lateral Cryphaea. Photo: Robin Stevenson;

Above right: *Sphagnum subnitens* Lustrous Bog-moss. Photo: Robin Stevenson;

Bottom left: *Leiocolea rutheana* Lesser Fen Notchwort (aka Norfolk Flapwort). The type specimen for this species was collected by Burrell & Clarke but has not been seen at Flordon Common since 1927. Photo: Bob Ellis.



Beetles

Left: *Curculio betulae* Photo:
Roger Key.

*Melolontha
melolontha* Photo:
Roger Key.



Orchestes testaceus
Photo: Albert de Wilde.



Oedemera nobilis, male
Photo: Roger Key.



Flies



Rhingia campestris. Photo: Francis Farrow.



Mesembrina meridiana. Photo: Francis Farrow.



Tipula luna. Photo: Francis Farrow.



Tachina fera. Photo: Francis Farrow.



Volucella zonaria. Photo: Francis Farrow.



Volucella bombylans. Photo: Francis Farrow.



Lilac Oysterling *Panus conchatus*. Unusually strongly coloured specimens from Flordon Common. *Photo: Neil Mahler.*



Left: Myopites inulaedysentericae on Common Fleabane. *Photo: Rex Hancy.*

Right: Aceria megacerus on Water Mint. *Photo: Rex Hancy.*





Temnothorax nylanderi. Photo: Doreen Wells.



P.C.

The scarce spider *Crustulina sticta*. Drawn by Pip Collyer.



Common Lizard. Photo: Peter Aspinall.

Table 4. Species list 2003-2010. Nomenclature follows Stace (1997). Column 3 indicates those species found within the area designated as a Site of Special Scientific Interest. Column 4 indicates the the habitat group (W=Water, M=marsh, H=Higher ground) if the species was listed in Burrell & Clarke (1910).

Species	English name	SSSI	B&C	Note
Equisetaceae				
<i>Equisetum arvense</i>	Field Horsetail	-	M	
<i>Equisetum fluviatile</i>	Water Horsetail	Y	W,M	
<i>Equisetum palustre</i>	Marsh Horsetail	Y	M	
Ophioglossaceae				
<i>Ophioglossum vulgatum</i>	Adder's-tongue	Y	M	
Dryopteridaceae				
<i>Dryopteris carthusiana</i>	Narrow Buckler-Fern	Y	-	
<i>Dryopteris dilatata</i>	Broad Buckler-fern	Y	-	
<i>Dryopteris filix-mas</i>	Male-fern	Y	H	
Ranunculaceae				
<i>Caltha palustris</i>	Marsh-marigold	Y	M	
<i>Ranunculus acris</i>	Meadow Buttercup	Y	M,H	
<i>Ranunculus bulbosus</i>	Bulbous Buttercup	Y	M,H	
<i>Ranunculus ficaria</i>	Lesser Celandine	Y	H	
<i>Ranunculus flammula</i>	Lesser Spearwort	Y	M	
<i>Ranunculus repens</i>	Creeping Buttercup	Y	M,H	
<i>Ranunculus sceleratus</i>	Celery-leaved Buttercup	Y	-	
Papaveraceae				
<i>Chelidonium majus</i>	Greater Celandine	Y	H	
<i>Papaver rhoeas</i>	Common Poppy	Y	H	
<i>Papaver somniferum</i>	Opium Poppy	Y	-	
Cannabaceae				
<i>Humulus Lupulus</i>	Hop	Y	H	
Urticaceae				
<i>Urtica dioica</i>	Common Nettle	Y	H	
<i>Urtica urens</i>	Small Nettle	Y	-	
Fagaceae				
<i>Quercus robur</i>	Pedunculate Oak	Y	M,H	
Betulaceae				
<i>Alnus glutinosa</i>	Alder	Y	H	
<i>Corylus avellana</i>	Hazel	Y	H	
Chenopodiaceae				
<i>Chenopodium album</i>	Fat-hen	-	H	
<i>Chenopodium bonus-henricus</i>	Good-King-Henry	Y	H	
Caryophyllaceae				
<i>Arenaria serpyllifolia</i>	Thyme-leaved Sandwort	Y	H	
<i>Cerastium fontanum</i>	Common Mouse-ear	Y	H	
<i>Cerastium glomeratum</i>	Sticky Mouse-ear	Y	H	
<i>Lychuis flos-cuculi</i>	Ragged-Robin	Y	M	
<i>Moehringia trinervia</i>	Three-nerved Sandwort	Y	M,D	
<i>Myosoton aquaticum</i>	Water Chickweed	Y	M	
<i>Sagina procumbens</i>	Procumbent Pearlwort	Y	H	
<i>Silene dioica</i>	Red Campion	Y	H	
<i>Silene latifolia</i>	White Campion	Y	H	

Species	English name	SSSI	B&C	Note
<i>Silene vulgaris</i>	Bladder Champion	Y	-	
<i>Silene ×hampeana</i> (<i>S. dioica</i> × <i>latifolia</i>)	Pink Champion	-	-	
<i>Stellaria graminea</i>	Lesser Stitchwort	Y	H	
<i>Stellaria media</i>	Common Chickweed	Y	H	
<i>Stellaria neglecta</i>	Greater Chickweed	Y	-	
<i>Stellaria pallida</i>	Lesser Chickweed	Y	-	
<i>Stellaria uliginosa</i>	Bog Stitchwort	Y	M,H	
Polygonaceae				
<i>Fallopia convolvulus</i>	Black-bindweed	-	H	
<i>Persicaria maculosa</i>	Redshank	Y	M	
<i>Polygonum aviculare</i>	Knotgrass	-	H	
<i>Rumex acetosa</i>	Common Sorrel	Y	M,H	
<i>Rumex acetosella</i>	Sheep's Sorrel	Y	H	
<i>Rumex conglomeratus</i>	Clustered Dock	Y	H	
<i>Rumex crispus</i>	Curled Dock	Y	H	
<i>Rumex obtusifolius</i>	Broad-leaved Dock	Y	H	
<i>Rumex sanguineus</i>	Wood Dock	Y	-	
Clusiaceae				
<i>Hypericum androsaemum</i>	Tutsan	-	-	
<i>Hypericum perforatum</i>	Perforate St John's-wort	-	H	
<i>Hypericum tetrapterum</i>	Square-stalked St John's-wort	Y	M	
Malvaceae				
<i>Malva neglecta</i>	Dwarf Mallow	Y	H	
<i>Malva sylvestris</i>	Common Mallow	Y	H	
Violaceae				
<i>Viola arvensis</i>	Field Pansy	Y	H	
<i>Viola odorata</i>	Sweet Violet	Y	-	
Cucurbitaceae				
<i>Bryonia dioica</i>	White Bryony	Y	H	
Salicaceae				
<i>Populus ×canadensis</i>	Hybrid Black-poplar	-	-	
<i>Salix alba</i>	White Willow	Y	H	
<i>Salix caprea</i>	Goat Willow	-	H	
<i>Salix cinerea</i>	Grey Willow	Y	-	
Brassicaceae				
<i>Alliaria petiolata</i>	Garlic Mustard	Y	H	
<i>Armoracia rusticana</i>	Horse-radish	-	-	
<i>Barbarea vulgaris</i>	Winter-cress	Y	-	
<i>Capsella bursa-pastoris</i>	Shepherd's-purse	-	H	
<i>Cardamine flexuosa</i>	Wavy Bitter-cress	Y	-	
<i>Cardamine hirsuta</i>	Hairy Bitter-cress	Y	H	
<i>Cardamine pratensis</i>	Cuckooflower	Y	M	
<i>Coronopus didymus</i>	Lesser Swine-cress	Y	-	
<i>Erophila verna</i>	Common Whitlowgrass	Y	H	
<i>Rorippa nasturtium-aquaticum</i> agg.	Water-cress	Y	W	
<i>Sisymbrium officinale</i>	Hedge Mustard	-	H	
<i>Reseda luteola</i>	Weld	Y	H	
Primulaceae				
<i>Anagallis arvensis</i>	Scarlet Pimpernel	-	H	

Species	English name	SSSI	B&C	Note
<i>Anagallis tenella</i>	Bog Pimpernel	Y	M	
<i>Primula veris</i>	Cowslip	Y	H	
<i>Samolus valerandi</i>	Brookweed	Y	-	
Grossulariaceae				
<i>Ribes nigrum</i>	Black Currant	Y	-	
<i>Ribes rubrum</i>	Red Currant	Y	-	
Saxifragaceae				
<i>Parnassia palustris</i>	Grass-of-Parnassus	Y	M	1
<i>Saxifraga granulata</i>	Meadow Saxifrage	Y	H	
Rosaceae				
<i>Agrimonia eupatoria</i>	Agrimony	Y	H	
<i>Aphanes arvensis</i>	Parsley-piert	Y	H	
<i>Crataegus monogyna</i>	Hawthorn	Y	H	
<i>Filipendula ulmaria</i>	Meadowsweet	Y	M	
<i>Geum rivale</i>	Water Avens	Y	M	
<i>Geum urbanum</i>	Wood Avens	Y	H	
<i>Geum ×intermedium (G. rivale x urbanum)</i>	A hybrid Avens	Y	-	
<i>Malus domestica</i>	Apple	Y	H	
<i>Potentilla anserina</i>	Silverweed	Y	H	
<i>Potentilla argentea</i>	Hoary Cinquefoil	Y	M,H	
<i>Potentilla erecta</i>	Tormentil	Y	M,H	
<i>Potentilla reptans</i>	Creeping Cinquefoil	Y	H	
<i>Potentilla sterilis</i>	Barren Strawberry	Y	H	
<i>Prunus avium</i>	Wild Cherry	-	H	
<i>Prunus cerasifera</i>	Cherry Plum	Y	-	
<i>Prunus spinosa</i>	Blackthorn	Y	H	
<i>Rosa canina</i> agg.	Dog-rose	Y	H	
<i>Rosa rubiginosa</i> agg.	Sweet-briar	-	H	
<i>Rubus caesius</i>	Dewberry	Y	-	
<i>Rubus fruticosus</i> agg.	Bramble	Y	H	
<i>Rubus idaeus</i>	Raspberry	-	H	
Fabaceae				
<i>Lathyrus pratensis</i>	Meadow Vetchling	Y	M	
<i>Lotus corniculatus</i>	Common Bird's-foot-trefoil	Y	H	
<i>Lotus pedunculatus</i>	Greater Bird's-foot-trefoil	Y	M,H	
<i>Medicago lupulina</i>	Black Medick	Y	H	
<i>Trifolium arvense</i>	Hare's-foot Clover	Y	H	
<i>Trifolium campestre</i>	Hop Trefoil	-	H	
<i>Trifolium dubium</i>	Lesser Trefoil	-	H	
<i>Trifolium micranthum</i>	Slender Trefoil	Y	H	
<i>Trifolium ornithopodioides</i>	Bird's-foot Clover	Y	-	
<i>Trifolium pratense</i>	Red Clover	Y	H	
<i>Trifolium repens</i>	White Clover	Y	H	
<i>Trifolium striatum</i>	Knotted Clover	Y	-	
<i>Ulex europaeus</i>	Gorse	-	H	
<i>Vicia cracca</i>	Tufted Vetch	Y	M,H	
<i>Vicia hirsuta</i>	Hairy Tare	-	H	
<i>Vicia sativa</i> subsp. <i>segetalis</i>	Common Vetch	-	H	
<i>Vicia sepium</i>	Bush Vetch	-	H	

Species	English name	SSSI	B&C	Note
<i>Vicia tetrasperma</i>	Smooth Tare	-	-	
Lythraceae				
<i>Lythrum salicaria</i>	Purple-loosestrife	Y	M	
Onagraceae				
<i>Chamerion angustifolium</i>	Rosebay Willowherb	-	-	
<i>Epilobium hirsutum</i>	Great Willowherb	Y	H	
<i>Epilobium parviflorum</i>	Hoary Willowherb	Y	H	
<i>Epilobium tetragonum</i>	Square-stalked Willowherb	Y	-	
Cornaceae				
<i>Cornus sanguinea</i>	Dogwood	Y	H	
Celastraceae				
<i>Euonymus europaeus</i>	Spindle	Y	-	
Euphorbiaceae				
<i>Euphorbia lathyris</i>	Caper Spurge	Y	-	
<i>Mercurialis perennis</i>	Dog's Mercury	Y	H	
Linaceae				
<i>Linum catharticum</i>	Fairy Flax	Y	M,H	
Polygalaceae				
<i>Polygala vulgaris</i>	Common Milkwort	Y	M	
Hippocastanaceae				
<i>Aesculus hippocastanum</i>	Horse-chestnut	Y	-	
Aceraceae				
<i>Acer campestre</i>	Field Maple	Y	H	
Geraniaceae				
<i>Erodium cicutarium</i>	Common Stork's-bill	Y	H	
<i>Geranium dissectum</i>	Cut-leaved Crane's-bill	Y	H	
<i>Geranium molle</i>	Dove's-foot Crane's-bill	Y	H	
<i>Geranium pusillum</i>	Small-flowered Crane's-bill	Y	-	
<i>Geranium robertianum</i>	Herb-Robert	Y	H	
Balsaminaceae				
<i>Impatiens glandulifera</i>	Indian Balsam	Y	-	2
Araliaceae				
<i>Hedera helix</i>	Common Ivy	Y	H	
Apiaceae				
<i>Angelica sylvestris</i>	Wild Angelica	Y	M	
<i>Anthriscus sylvestris</i>	Cow Parsley	Y	H	
<i>Apium nodiflorum</i>	Fool's-water-cress	Y	W	
<i>Berula erecta</i>	Lesser Water-parsnip	Y	W	
<i>Chaerophyllum temulum</i>	Rough Chervil	Y	-	
<i>Conium maculatum</i>	Hemlock	Y	H	
<i>Heracleum sphondylium</i>	Hogweed	Y	M	
<i>Hydrocotyle vulgaris</i>	Marsh Pennywort	Y	M	
<i>Pimpinella saxifraga</i>	Burnet-saxifrage	-	-	
<i>Torilis japonica</i>	Upright Hedge-parsley	-	H	
Solanaceae				
<i>Solanum dulcamara</i>	Bittersweet	Y	H	
Convolvulaceae				
<i>Calystegia sepium</i>	Hedge Bindweed	Y	-	
<i>Convolvulus arvensis</i>	Field Bindweed	-	H	

Species	English name	SSSI	B&C	Note
Menyanthaceae				
<i>Menyanthes trifoliata</i>	Bogbean	Y	M	
Boraginaceae				
<i>Anchusa arvensis</i>	Bugloss	-	-	
<i>Myosotis arvensis</i>	Field Forget-me-not	Y	H	
<i>Myosotis ramosissima</i>	Early Forget-me-not	Y	H	
<i>Myosotis scorpioides</i>	Water Forget-me-not	Y	M	
<i>Pentaglottis sempervirens</i>	Green Alkanet	Y	-	
<i>Symphytum ×uplandicum</i> (<i>S. asperum</i> × <i>S. officinale</i>)	Russian Comfrey	-	-	
Verbenaceae				
<i>Verbena officinalis</i>	Vervain	Y	H	
Lamiaceae				
<i>Ajuga reptans</i>	Bugle	Y	-	
<i>Ballota nigra</i>	Black Horehound	Y	H	
<i>Clinopodium vulgare</i>	Wild Basil	Y	H	
<i>Galeopsis tetrahit</i>	Common Hemp-nettle	Y	H	
<i>Glechoma hederacea</i>	Ground-ivy	Y	H	
<i>Lamium album</i>	White Dead-nettle	Y	H	
<i>Lamium maculatum</i>	Spotted Dead-nettle	Y	-	
<i>Lamium purpureum</i>	Red Dead-nettle	-	H	
<i>Lycopus europaeus</i>	Gypsywort	Y	M	
<i>Mentha aquatica</i>	Water Mint	Y	M	
<i>Prunella vulgaris</i>	Selfheal	Y	M,H	
<i>Scutellaria galericulata</i>	Skullcap	Y	M	
<i>Stachys sylvatica</i>	Hedge Woundwort	Y	H	
Callitrichaceae				
<i>Callitriche</i> sp.	Water-starwort	-	-	
Plantaginaceae				
<i>Plantago coronopus</i>	Buck's-horn Plantain	Y	H	
<i>Plantago lanceolata</i>	Ribwort Plantain	Y	M,H	
<i>Plantago major</i>	Greater Plantain	Y	H	
<i>Plantago media</i>	Hoary Plantain	Y	H	
Oleaceae				
<i>Fraxinus excelsior</i>	Ash	Y	H	
Scrophulariaceae				
<i>Euphrasia nemorosa</i>	Eyebright	Y	(M,H)	
<i>Euphrasia pseudokernerii</i>	Eyebright	Y	(M,H)	
<i>Linaria vulgaris</i>	Common Toadflax	-	H	
<i>Odontites vernus</i>	Red Bartsia	-	M	
<i>Pedicularis palustris</i>	Marsh Lousewort	Y	M	1
<i>Rhinanthus minor</i>	Yellow-rattle	Y	-	
<i>Scrophularia auriculata</i>	Water Figwort	Y	M	
<i>Verbascum thapsus</i>	Great Mullein	Y	H	
<i>Veronica anagallis-aquatica</i>	Blue Water-speedwell	Y	W	
<i>Veronica arvensis</i>	Wall Speedwell	Y	H	
<i>Veronica beccabunga</i>	Brooklime	Y	W	
<i>Veronica catenata</i>	Pink Water-speedwell	Y	(-)	
<i>Veronica chamaedrys</i>	Germander Speedwell	Y	H	

Species	English name	SSSI	B&C	Note
<i>Veronica hederifolia</i>	Ivy-leaved Speedwell	Y	-	
<i>Veronica montana</i>	Wood Speedwell	Y	-	
<i>Veronica persica</i>	Common Field-speedwell	Y	-	
<i>Veronica serpyllifolia</i>	Thyme-leaved Speedwell	Y	H	
Lentibulariaceae				
<i>Pinguicula vulgaris</i>	Common Butterwort	Y	M	3
Campanulaceae				
<i>Campanula rotundifolia</i>	Harebell	-	H	
Rubiaceae				
<i>Galium aparine</i>	Cleavers	Y	H	
<i>Galium palustre</i>	Marsh-bedstraw	Y	M,H	
<i>Galium uliginosum</i>	Fen Bedstraw	Y	M	
<i>Galium verum</i>	Lady's Bedstraw	Y	H	
<i>Sherardia arvensis</i>	Field Madder	-	H	
Caprifoliaceae				
<i>Lonicera periclymenum</i>	Honeysuckle	Y	H	
<i>Sambucus nigra</i>	Elder	Y	H	
<i>Viburnum opulus</i>	Guelder-rose	Y	H	
Adoxaceae				
<i>Adoxa moschatellina</i>	Moschatel	Y	H	
Valerianaceae				
<i>Valeriana dioica</i>	Marsh Valerian	Y	M	
<i>Valeriana officinalis</i>	Common Valerian	Y	M	
Dipsacaceae				
<i>Dipsacus fullonum</i>	Wild Teasel	Y	-	
<i>Succisa pratensis</i>	Devil's-bit Scabious	Y	M	
Asteraceae				
<i>Achillea millefolium</i>	Yarrow	Y	H	
<i>Arctium minus</i>	Lesser Burdock	Y	-	
<i>Artemisia vulgaris</i>	Mugwort	-	H	
<i>Bellis perennis</i>	Daisy	Y	H	
<i>Carduus crispus</i>	Wetted Thistle	-	-	
<i>Carduus nutans</i>	Musk Thistle	Y	H	
<i>Centaurea nigra</i>	Common Knapweed	Y	H	
<i>Cirsium arvense</i>	Creeping Thistle	Y	H	
<i>Cirsium palustre</i>	Marsh Thistle	Y	M	
<i>Cirsium vulgare</i>	Spear Thistle	Y	H	
<i>Crepis capillaris</i>	Smooth Hawk's-beard	Y	H	
<i>Eupatorium cannabinum</i>	Hemp-agrimony	Y	M	
<i>Filago vulgaris</i>	Common Cudweed	Y	H	
<i>Hypochaeris radicata</i>	Cat's-ear	-	M,H	
<i>Lactuca virosa</i>	Great Lettuce	-	-	
<i>Lapsana communis</i>	Nipplewort	Y	-	
<i>Leontodon autumnalis</i>	Autumn Hawkbit	-	M	
<i>Leontodon hispidus</i>	Rough Hawkbit	Y	M,H	
<i>Leucanthemum vulgare</i>	Oxeye Daisy	Y	M,H	
<i>Mycelis muralis</i>	Wall Lettuce	Y	-	
<i>Onopordum acanthium</i>	Cotton Thistle	Y	H	
<i>Pilosella officinarum</i>	Mouse-ear-hawkweed	Y	H	

Species	English name	SSSI	B&C	Note
<i>Pulicaria dysenterica</i>	Common Fleabane	Y	M	
<i>Senecio aquaticus</i>	Marsh Ragwort		M	4
<i>Senecio erucifolius</i>	Hoary Ragwort	Y	M,H	
<i>Senecio jacobaea</i>	Common Ragwort	Y	M,H	
<i>Senecio vulgaris</i>	Groundsel	Y	H	
<i>Silybum marianum</i>	Milk Thistle	Y	-	
<i>Sonchus arvensis</i>	Perennial Sowthistle		-	4
<i>Sonchus asper</i>	Prickly Sow-thistle	Y	-	
<i>Taraxacum</i> agg.	Dandelion	-	H	
<i>Tragopogon pratensis</i>	Goat's-beard	-	-	
<i>Tripleurospermum inodorum</i>	Scentless Mayweed	Y	H	
<i>Tussilago farfara</i>	Colt's-foot	Y	-	
Juncaginaceae				
<i>Triglochin palustre</i>	Marsh Arrowgrass	Y	M	
Potamogetonaceae				
<i>Potamogeton coloratus</i>	Fen Pondweed	Y	-	
Araceae				
<i>Arum maculatum</i>	Lords-and-Ladies	Y	H	
Lemnaceae				
<i>Lemna minor</i>	Common Duckweed	Y	W	
Juncaceae				
<i>Juncus acutiflorus</i>	Sharp-flowered Rush	Y	M	
<i>Juncus articulatus</i>	Jointed Rush	Y	-	
<i>Juncus bufonius</i>	Toad Rush	Y	M	
<i>Juncus effusus</i>	Soft-rush	Y	M	
<i>Juncus inflexus</i>	Hard Rush	Y	M	
<i>Juncus subnodulosus</i>	Blunt-flowered Rush	Y	M	
<i>Luzula campestris</i>	Field Wood-rush	Y	H	
<i>Luzula multiflora</i>	Heath Wood-rush	Y	(-)	
Cyperaceae				
<i>Blysmus compressus</i>	Flat-sedge	Y	-	
<i>Carex acutiformis</i>	Lesser Pond-sedge	Y	-	
<i>Carex caryophyllea</i>	Spring-sedge	Y	-	
<i>Carex diandra</i>	Lesser Tussock-sedge	Y	(-)	
<i>Carex disticha</i>	Brown Sedge	Y	-	
<i>Carex divulsa</i> subsp. <i>divulsa</i>	Grey Sedge	Y	-	
<i>Carex elata</i>	Tufted-sedge	Y	-	
<i>Carex flacca</i>	Glaucous Sedge	Y	M	
<i>Carex hirta</i>	Hairy Sedge	Y	M	
<i>Carex hostiana</i>	Tawny Sedge	Y	-	
<i>Carex nigra</i>	Common Sedge	Y	M	
<i>Carex otrubae</i>	False Fox-sedge	Y	M	
<i>Carex panicea</i>	Carnation Sedge	Y	M	
<i>Carex paniculata</i>	Greater Tussock-sedge	Y	M	
<i>Carex pulicaris</i>	Flea Sedge	Y	M	
<i>Carex remota</i>	Remote Sedge	Y	-	
<i>Carex rostrata</i>	Bottle Sedge	Y	M	
<i>Carex viridula</i> subsp. <i>brachyrrhyncha</i>	Long-stalked Yellow-sedge	Y	M	
<i>Eriophorum angustifolium</i>	Common Cottongrass	Y	M	

Species	English name	SSSI	B&C	Note
<i>Eriophorum latifolium</i>	Broad-leaved Cottongrass	Y	(-)	
<i>Isolepis setacea</i>	Bristle Club-rush	Y	-	
<i>Schoenus nigricans</i>	Black Bog-rush	Y	M	
Poaceae				
<i>Agrostis capillaris</i>	Common Bent	Y	H	
<i>Agrostis stolonifera</i>	Creeping Bent	Y	-	
<i>Alopecurus pratensis</i>	Meadow Foxtail	Y	-	
<i>Anisantha sterilis</i>	Barren Brome	Y	H	
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	Y	H	
<i>Arrhenatherum elatius</i>	False Oat-Grass	Y	H	
<i>Brachypodium sylvaticum</i>	False-brome	Y	-	
<i>Briza media</i>	Quaking-grass	Y	M	
<i>Bromopsis ramosa</i>	Hairy-brome	Y	-	
<i>Bromus hordeaceus</i>	Soft-brome	-	-	
<i>Cynosurus cristatus</i>	Crested Dog's-tail	-	H	
<i>Dactylis glomerata</i>	Cock's-foot	-	H	
<i>Deschampsia cespitosa</i>	Tufted Hair-grass	Y	H	
<i>Elytrigia repens</i>	Common Couch	-	H	
<i>Festuca arundinacea</i>	Tall Fescue	Y	-	
<i>Festuca gigantea</i>	Giant Fescue	-	-	
<i>Festuca pratensis</i>	Meadow Fescue	Y	H	
<i>Festuca rubra</i> agg.	Red Fescue	Y	-	
<i>Glyceria fluitans</i>	Floating Sweet-grass	Y	W	
<i>Glyceria maxima</i>	Reed Sweet-grass	Y	W	
<i>Glyceria notata</i>	Plicate Sweet-grass	Y	-	
<i>Holcus lanatus</i>	Yorkshire-fog	Y	H	
<i>Lolium perenne</i>	Perennial Rye-grass	-	H	
<i>Molinia caerulea</i>	Purple Moor-grass	Y	M	
<i>Phalaris arundinacea</i>	Reed Canary-grass	Y	M	
<i>Phleum bertolonii</i>	Smaller Cat's-tail	-	(D)	
<i>Phleum pratense</i> sens. lat.	Timothy	-	D	
<i>Phragmites australis</i>	Common Reed	Y	W	
<i>Poa annua</i>	Annual Meadow-grass	Y	D	
<i>Poa humilis</i>	Spreading Meadow-grass	-	(-)	
<i>Poa pratensis</i> sens. lat.	Smooth Meadow-grass	Y	H	
<i>Poa trivialis</i>	Rough Meadow-grass	Y	-	
<i>Trisetum flavescens</i>	Yellow Oat-grass	-	H	
<i>Vulpia bromoides</i>	Squirreltail Fescue	Y	-	
Sparganiaceae				
<i>Sparganium erectum</i>	Branched Bur-reed	-	W	
Typhaceae				
<i>Typha latifolia</i>	Bulrush	Y	-	
Liliaceae				
<i>Allium ursinum</i>	Ramsons	Y	H	
<i>Galanthus nivalis</i>	Snowdrop	Y	-	
<i>Hyacinthoides hispanica</i>	Spanish Bluebell	Y	-	
<i>Hyacinthoides</i> × <i>massartiana</i> (<i>H. non-scripta</i> × <i>hispanica</i>)	Hybrid Bluebell	Y	-	
<i>Narcissus</i> agg.	Cultivated Daffodil	Y	-	

Species	English name	SSSI	B&C	Note
<i>Ornithogalum angustifolium</i>	Star-of-Bethlehem	Y	-	
<i>Iris pseudacorus</i>	Yellow Iris	Y	M	
Dioscoreaceae				
<i>Tamus communis</i>	Black Bryony	Y	H	
Orchidaceae				
<i>Dactylorhiza fuchsii</i>	Common Spotted-orchid	Y	M	
<i>Dactylorhiza incarnata</i>	Early marsh-orchid	Y	M	1
<i>Dactylorhiza praetermissa</i>	Southern Marsh-orchid	Y	M	
<i>Dactylorhiza praetermissa</i> × <i>traunsteineri</i>	A hybrid Marsh-orchid	Y	(-)	
<i>Dactylorhiza traunsteineri</i>	Narrow-leaved Marsh-orchid	Y	(-)	
<i>Dactylorhiza</i> × <i>grandis</i> (<i>D. fuchsii</i> × <i>praetermissa</i>)	A hybrid Marsh-orchid	Y	-	
<i>Epipactis palustris</i>	Marsh Helleborine	Y	M	
<i>Gymnadenia conopsea</i>	Fragrant Orchid	Y	M	
<i>Listera ovata</i>	Common Twayblade	Y	M	
<i>Ophrys apifera</i>	Bee Orchid	-	D	

¹ Wheeler & Shaw (2007). ² Seen occasionally and removed. ³ 2003 only. ⁴ NVC survey 1993.

Mosses and liverworts

Mary Ghullam

Flordon Common is important in the history of bryophyte recording both internationally and in Norfolk. It was here that Burrell first found the subsequently named Norfolk Flapwort *Leiocolea rutheana* var. *laxa*¹ in 1909 (see photo p.20) and he sent a specimen to Professor Schiffner of Vienna, who “placed it as *Lophozia Schultzii* under the new name var. *laxa* Schiffn.” The type specimens found in ‘*Arundo-Juncus* marsh’ at Flordon still exist in the National Museum of Wales and the British Bryological Society (BBS) herbaria (Holyoak 2004a).

At the same time Burrell and Clarke found another liverwort, thought by them to be *Moerckia flotoviana*. As it was growing in an unusual habitat and in a different form from the species known to them, they noted the need “to keep it under observation until mature sporophytes are available” (Burrell & Clarke 1910). This turned out to be the first record for the species in Norfolk (Burrell 1914). Another scarce bryophyte, the coprophilous Cruet Collar-moss *Splachnum ampullaceum* was found in the marsh and this was Norfolk’s only recent record at that time. Of these three notable bryophytes only *Moerckia flotoviana* has been recorded recently - the latest record in 2003 (see photo p.20).

Burrell and Clarke visited both the eastern and western parts of Flordon Common over a period of two years (1908-1909) from early spring to late autumn. The most recent recording efforts of the NNNS Research Group span a similar length of time and season (2009-2010). In fact all post 1989 bryophyte records cited in Table 3 were made

from early spring to late autumn. Only the NNNS Research Group and the 2003 BBS spring meeting, however, covered both the eastern and western parts of the Common.

Burrell and Clarke did not separate their records into these two geographical areas but into habitat groups that spanned both portions. These habitat groups consisted of ‘water’, ‘marsh’ and ‘higher ground’. They recorded 5, 28 and 15 species from each respectively. In all, the total number of different species came to 46². Their comment that “by far the larger number of [plant] species is to be found on the higher ground, owing to its much greater diversity” does not hold true for bryophytes, despite its greater diversity of habitats.

Bryophyte losses

Figure 1 shows the numbers of mosses and liverworts recorded by Burrell and Clarke that were still present in the recent survey and those that were present in 1910 but not found now. Of the 10 liverworts and 35 mosses³ they listed, 17 have not been recorded recently (5 liverworts and 12 mosses) – see Table 1.

Water

Burrell and Clarke described scores of small ponds on the Common as well as six springs and various ditches. Now there are only two man-made ponds. It was clearly much wetter then than it is now. Even in Burrell and Clarke’s time the Common was much drier than previously (see Burrell & Clarke page 175).

2 Burrell and Clarke’s total of 48 failed to take account of the two species occurring in more than one habitat.

3 The two *Hypnum aduncum* varieties are now subsumed into one species, *Drepanocladus aduncus*.

1 Names used here follow modern nomenclature of Hill et al 2008. For Burrell and Clarke’s nomenclature see Table 3.

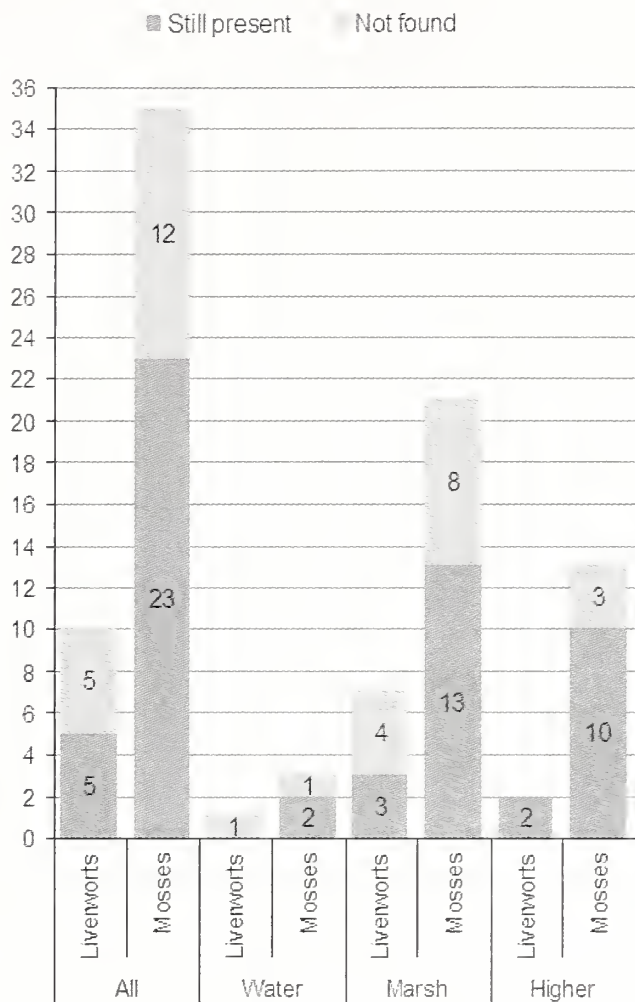


Figure 1. Mosses and liverworts listed by Burrell and Clarke.

The ditch on the Western Common where Fringed Heartwort *Ricciocarpos natans* (see photo p. 20) grew in abundance in the autumn of 1908 is now very overgrown. The species is considered rare in Beckett et al (1999) although it is possibly under-recorded, as it tends to sink to the bottom of water bodies in the winter. It is more surprising that Kneiff's Hook-moss *Drepanocladus aduncus* has not been recorded recently, as it is not an uncommon species and tolerates some nutrient enrichment. Giant Spear-moss *Calliergon giganteum* and Hooked Scorpion-moss *Scorpidium scorpioides* are still present but are now found just in the fen area of the Eastern Common.

Marsh

Burrell and Clarke describe the marsh as having virtually no grass, other than a few small areas of Purple Moor-grass *Molinia caerulea*, "the foundation of the marsh floor being moss", mainly Pointed Spear-moss *Calliergonella cuspidata* and Chalk Comb-

moss *Ctenidium molluscum*. Most of the marsh area is on the Eastern Common, in what is now designated as a SSSI. A small marshy area on the Western Common is now mostly reed surrounded by trees and scrub.

Only one of the three species highlighted by Burrell and Clarke as noteworthy persists in the fen, while the other two have not been recorded for a very long while. Despite much searching, most recently by David Holyoak in 2004, *Leiocolea rutheana* var. *laxa* has not been vouched for since 16 October 1927, when HH Knight gathered it. In Holyoak's view it was probably exterminated as a result of drainage ditches dug during World War II (Holyoak 2004a).

Splachnum ampullaceum was the only recent Norfolk record of the time and it was already considered rare in the eastern counties. It has not been recorded in Norfolk

Table 1. Bryophytes recorded in Burrell & Clarke (1910) but not between 1995 and 2010. Arranged by habitat group. L=Liverwort, M=Moss. Name changes since Burrell and Clarke are listed in Table 2.

Water		
Fringed Heartwort	<i>Ricciocarpos natans</i>	L
Kneiff's Hook-moss	<i>Drepanocladus aduncus</i>	M
Marsh		
Delicate Germanderwort	<i>Riccardia multifida</i>	L
Lesser Germanderwort	<i>Riccardia incurvata</i>	L
Greater Featherwort	<i>Plagiochila asplenioides</i>	L
Norfolk Flapwort	<i>Leiocolea rutheana</i> var. <i>laxa</i>	L
Cruet Collar-moss	<i>Splachnum ampullaceum</i>	M
Fountain Apple-moss	<i>Philonotis fontana</i>	M
Thick-nerved Apple-moss	<i>Philonotis calcarea</i>	M
Bimous Marsh Bryum	<i>Bryum pseudotriquetrum</i> var. <i>bimum</i>	M
Tree-moss	<i>Climacium dendroides</i>	M
Streaky Feather-moss	<i>Brachythecium glareosum</i>	M
Chalk Hook-moss	<i>Drepanocladus sendtneri</i>	M
Rusty Hook-moss	<i>Scorpidium revolvens</i>	M
Higher ground		
Silky Wall Feather-moss	<i>Homalothecium sericeum</i>	M
Springy Turf-moss	<i>Rhytidiadelphus triquetrus</i>	M
Squirrel-tail Moss	<i>Leucodon sciuroides</i>	M

Table 2. Name changes since Burrell & Clarke (1910) Burrell and Clarke do not specifically cite their source of nomenclature, but for liverworts they mention the Census Catalogue of British Hepatics (Macvicar 1905) and for mosses they probably followed the Census Catalogue of British Mosses (Ingham 1907).

* *Chiloscyphus polyanthos* has now been split and it is probable that Burrell's was *C. pallescens* as *C. polyanthos* has not been confirmed in Norfolk.

Burrell & Clarke (1910)	Hill <i>et al.</i> (2008)
Liverworts (Marchantiophyta)	
<i>Aneura multifida</i>	<i>Riccardia multifida</i>
<i>Aneura incurvata</i>	<i>Riccardia incurvata</i>
<i>Chiloscyphus polyanthos</i>	<i>Chiloscyphus pallescens</i> *
<i>Lophozia Schultzei</i> var. <i>laxa</i>	<i>Leiocolea rutheana</i> var. <i>laxa</i>
Mosses (Bryophyta)	
<i>Tortula laevipila</i>	<i>Syntrichia laevipila</i>
<i>Bryum bimum</i>	<i>Bryum pseudotriquetrum</i> var. <i>bimum</i>
<i>Bryum pseudotriquetrum</i>	<i>Bryum pseudotriquetrum</i> var. <i>pseudotriquetrum</i>
<i>Mnium affine</i>	<i>Plagiommium affine</i>
<i>Hypnum commutatum</i>	<i>Palustriella commutata</i> var. <i>commutata</i>
<i>Amblystegium filicinum</i>	<i>Cratoneuron filicinum</i>
<i>Hypnum stellatum</i>	<i>Campylium stellatum</i>
<i>Hypnum elodes</i>	<i>Campyliadelphus elodes</i>
<i>Hypnum aduncum</i> var. <i>aquaticum</i>	<i>Drepanocladus aduncus</i>
<i>Hypnum aduncum</i> var. <i>polycarpon</i>	<i>Drepanocladus aduncus</i>
<i>Hypnum sendtneri</i>	<i>Drepanocladus sendtneri</i>
<i>Hypnum revolvens</i>	<i>Scorpidium revolvens</i>
<i>Hypnum intermedium</i>	<i>Scorpidium cossouii</i>
<i>Hypnum scorpioides</i>	<i>Scorpidium scorpioides</i>
<i>Hypnum giganteum</i>	<i>Calliergon giganteum</i>
<i>Camptothecium sericeum</i>	<i>Homalothecium sericeum</i>
<i>Hypnum cuspidatum</i>	<i>Calliergonella cuspidata</i>
<i>Hypnum molluscum</i>	<i>Ctenidium molluscum</i>
<i>Hylocomium triquetrum</i>	<i>Rhytidiadelphus triquetrus</i>

since 1973, or recently in any of the adjoining vice-counties (Hill *et al.* 2008). Lawley (2010) suggests that drier conditions following drainage, which makes dung less persistent, do not allow the moss to complete its life cycle and the modern use of parasiticides may reduce the invertebrates that spread the spores. This could partly explain both the rarity of *Splachnum* in Burrell and Clarke's day and its continuing absence.

It is much harder to explain satisfactorily why some species have not been recorded in recent times while others are still present. Certain 'missing' species are now generally uncommon, such as Chalk Hook-moss

Drepanocladus sendtneri and Streaky Feather-moss *Brachythecium glareosum*. Bimous Marsh Bryum *Bryum pseudotriquetrum* var. *bimum* is possibly under recorded. Lesser Germanderwort *Riccardia incurvata* is not mentioned at all in Burrell (1914), Petch & Swann (1968) or in the current Census Catalogue for vice-county 27 (Hill *et al.* 2008), which may imply a mistaken record.

Certainly the area of marsh has diminished since Burrell and Clarke's time. There is very little marsh left on the Western Common and the fen on the Eastern Common is much drier, following the cutting of more drainage ditches. There are many fewer pools and presumably the water table is

lower. Although there is still base-rich fen present, it is possible that both changes in alkalinity and an increase in nutrients may have altered it. The area of Purple Moor-grass is much extended since 1910 and Alder *Alnus glutinosa* and scrub have encroached into the marsh, drying it out even further.

Some of the characteristic rich fen species, described in Porley & Hodgetts (2005) as requiring higher pH and mineral levels, are still present. These include *Scorpidium scorpioides*, Intermediate Hook-moss *S. cossonii*, Claw-leaved Hook-moss *Palustriella commutata* and *Moerckia flotoviana*. Others, such as *Drepanocladus sendtneri*, Fountain Apple-moss *Philonotis fontana*, Thick-nerved Apple-moss *P. calcarea* and Delicate Germanderwort *Riccardia multifida* seem to have gone, perhaps needing a more exacting mix of conditions. Some species that require both base-richness and a degree of nutrient enrichment are still present e.g. *Calliergon giganteum*. Others like Maiden-hair Pocket-moss *Fissidens adianthoides* and *Ctenidium molluscum* are quite capable of growing in much drier calcareous grassland as well as fen.

Higher Ground

Most of the species recorded on higher ground by Burrell and Clarke are still found on the Common. The two liverwort species, however, are now found in wetter conditions than might be assumed from Burrell and Clarke. Bifid Crestwort *Lophocolea bidentata* grows primarily on the edge of the Purple Moor-grass tussocks in the marsh and Crescent-cup Liverwort *Lunularia cruciata* on the edge of the ditches or the stream. Three of the mosses are no longer present. It is surprising that the very widespread Silky Wall Feather-moss *Homalothecium sericeum* has not been recorded recently, as it grows both on man-made structures and trees, as does Squirrel-tail Moss *Leucodon sciuroides*. The latter, however, is the rarer of the two and would not now be considered as generally

frequent as it was by Burrell (1914). Big Shaggy-moss *Rhytidiadelphus triquetrus*, described by Burrell in 1914 as very common on banks, is now much less so in Norfolk and is usually found in woodland rides and chalk grassland. (Beckett *et al.* 1999).

The mosses that are still present are virtually all very common and catholic in their requirements, growing primarily on paths, bare soil or on the bark of a range of trees and shrubs. There are two exceptions. The tiny Variable Forklet-moss *Dicranella varia*, which favours clay and marl pits, is growing, where Burrell and Clarke presumably found it, in what remains of old workings at the edge of the Western Common. Small Hairy Screw-moss *Syntrichia laevipila*, which was growing on a large Ash *Fraxinus excelsior* on the Western Common in 2010, is less widespread. Burrell and Clarke mention a very large Elder *Sambucus nigra*, growing at the far end of the Western Common, as well as a willow. It may have been here that they recorded the *Syntrichia*.

Bryophyte gains

Since 1910 the numbers of both moss and liverwort species recorded in Norfolk have increased quite considerably (Stevenson 1994), so it would not seem to be too surprising that nine liverworts and 54 mosses, recorded recently on the Common, were not noted by Burrell and Clarke. A few of these 'new' species were either unknown at the time in Britain or not recognised as species in their own right. The alien Heath Star-moss *Campylopus introflexus* was first collected in Britain in 1941, having originated in the southern hemisphere (Porley & Hodgetts 2005) and Lesser Screw-moss *Syntrichia virescens* was first recorded in Britain in 1958 in Yorkshire (Smith 2004). Flabby Thread-moss *Bryum moravicum* is a recently recognised segregate of Capillary Thread-moss *Bryum capillare* (Holyoak 2004b).

Some species such as River Feather-moss *Brachythecium rivulare*, Pale Thread-moss

Bryum pallens or Jagged Germanderwort *Riccardia chamedryfolia* are not mentioned at all by Burrell (1914) and were presumably unknown in Norfolk at that time. Petch & Swann (1968) also suggest that Burrell may well have failed to separate Showy Feather-moss *Oxyrrhynchium speciosum* from Swartz's Feather-moss *O. hians*. That still leaves eight of the liverworts and 49 of the mosses to be accounted for.

Woodland and scrub

A brief glance at Burrell and Clarke's map of Flordon Common shows very little in the nature of woodland or trees. The very fact that they single out both the Elder and the willow for mention would seem to confirm that. The 1880-82 Ordnance Survey map shows virtually no trees other than the conifers in the pit on the Western Common, also shown by Burrell and Clarke but now no longer present. It is clear from aerial photographs that the number of trees has greatly increased in subsequent years particularly since 1946. Presumably the mix of tree species has increased as well so that the range of barks available are more diverse both in their surface structure and their chemical nature, providing potential habitat for a wider range of epiphytic species.

The extensive area of gorse and bramble, described as dominant on part of Flordon by Clarke (1914) under his analysis of 'Heath formation – *Ulex* or scrub association' has gone from the Western Common and it is now mostly rank grassland. The former marsh on the Western Common, however, is partly a mixture of scrub and larger trees and it is there that the epiphytic mosses Lateral Cryphaea *Cryphaea heteromalla* (see photo p. 20), Many-fruited Leskea *Leskea polycarpa*, Lyell's Bristle-moss *Orthotrichum lyellii* and Elegant Bristle-moss *O. pulchellum* are to be found. Some scrub has also developed on the Eastern Common, especially on the high ground to the east of the large pond and on some of the raised areas within the fen.

The wooded southern boundary of the Eastern Common bordering the stream provides a moist shaded habitat both for epiphytic and woodland floor bryophytes. Cypress-leaved Plait-moss *Hypnum cupressiforme*, Clustered Feather-moss *Rhynchostegium confertum* grow on the trunks and branches of the trees with such liverworts as Forked Veilwort *Metzgeria furcata* and Dilated Scalewort *Frullania dilatata* while Larger Mouse-tail Moss *Isoetecium alopecuroides* and Woodsy Silk-moss *Plagiotechium nemorale* grow around the bases. Fallen deadwood and old stumps now provide niches for Bud-headed Groove-moss *Aulacomnium androgynum* and Pelucid Four-tooth Moss *Tetraphis pellucida*. The rather bare damp woodland floor provides a habitat for Hart's-tongue and Swan's-neck Thyme-mosses *Plagiomnium undulatum* and *Mnium hornum* as well as Common Smoothcap *Atrichum undulatum*. Just how much this area has changed since 1910 is emphasised by the fact that Burrell and Clarke failed to record the ubiquitous Common Feather-moss *Kindbergia praelonga* anywhere on the Common, despite it being a very widespread species at the time (Burrell 1914).

Grassland

In 1910 a mixture of horses, cattle and poultry grazed the Common. Parts of the Common were cut for hay and sedge and rush was also cut for litter. Gorse was used for fuel and Hazel *Corylus avellana* and Ash were taken from the hedgerows. Although much of the Eastern Common is still being grazed, it is now only by a few cattle. Different types of animals graze in different ways providing a mosaic of varying habitats. Changes in the breeds of cattle used may also have had an effect on the nature of the grass sward. The area to the extreme east is now amenity grassland, virtually devoid of bryophytes. Rabbits still graze the Common, helping provide closely cropped grass along the higher ground on the northern edge of the Eastern Common.

There has been, however, little or no recent grazing on the Western Common and most of the grass there is long and rank and is presumably affected by nutrients from the adjacent arable field. It is only closer to the remains of the pit at the far western end that bryophytes such as the Neat, Yellow and Whitish Feather-mosses *Pseudoscleropodium purum*, *Homalothecium lutescens* and *Brachythecium albicans* appear in the grassland.

Bare ground

A number of the bryophytes new to the site are those that benefit from bare soil. Common Bladder-moss *Physcomitrium pyriforme* grows profusely on the dredgings from the pond in front of the house and the ditches of the Eastern Common. Great Scented Liverwort *Conocephalum conicum* colonises the bare stream banks, benefiting from the extra shade. Deer, unrecorded by Burrell and Clarke, contribute to keeping the woodland floor bare, allowing room for the Long-beaked and Dotted Thyme-mosses *Plagiomnium rostratum* and *Rhizomnium punctatum*. Although the pit in the northwest corner of the Eastern Common is now filled in and grassed over, there is still a steep bare surface on the much-reduced pit at the far end of the Western Common. Here Fallacious Beard-moss *Didymodon fallax* and Great Hairy Screw-moss *Syntrichia ruralis* have found a foothold along with other bryophytes recorded by Burrell and Clarke, such as Redshank *Ceratodon purpureus*.

Marsh

The changes in the marsh both in extent and nature, discussed above, including alterations in management with rush and sedge no longer cut for litter, would suggest little prospect of new base-rich fen species appearing. There are, however, a number of such species that were not noted by Burrell and Clarke. These include the Felted and Tall Thyme-mosses *Rhizomnium pseudopunctatum* and *Plagiomnium ela-*

tum and the liverwort Greasewort *Aneura pinguis*. Others, characteristic of a greater degree of eutrophication, such as Heart-leaved Spear-moss *Calliergon cordifolium*, have also appeared.

Most noticeable is the appearance of more acid tolerant species, linked partly with the increased area of dense Purple Moor-grass tussocks. Since 1910 three species of *Sphagnum* have been noted on the Eastern Common. Currently the most extensive is Lustrous Bog-moss *Sphagnum subnitens* (see photo p. 20), Bog Groove-moss *Aulacomnium palustre* and liverworts such as Common Pouchwort *Calypogeia fissa* grow among the tussocks. These tussocks also seem to provide a drier transition zone for some more base loving species such as Common Striated Feather-moss *Eurhynchium striatum*.

Other factors

An examination of the 'new' bryophyte species shows that the two largest groups of incomers are associated with either trees and woodland or dry bare consolidated substrates. Epiphytic species, rather rare in Burrell's day (Burrell 1914), like *Frullania dilatata*, *Cryphaea heteromalla* and *Orthotrichum lyellii* may have also benefited from cleaner air as well as the increased availability of bark niches. Adams & Preston (1992) include these three species in a list of those most adversely affected by atmospheric pollution, particularly by sulphur dioxide. They also report a spectacular recovery and recolonisation of bryophyte species in recent years.

Where there is vehicular access on the Common, and it is probable that such traffic has increased in recent years, the ground is often bare and compacted so that small species like Hornschuch's Beard-moss *Pseudocrossidium hornschuchianum* and Bicoloured Bryum *Bryum dichotomum* can gain a foothold.

Even though Flordon Common has gone through a number of changes since the

days of Burrell and Clarke, it is still a place with nearly a 100 species of bryophyte to enjoy. This is quite a remarkable number of species for a relatively small site in lowland eastern Britain, and no doubt there are more species yet to be found.

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M Ghullam 5 Beech Drive, North Walsham, Norfolk NR28 0BZ

Table 3. Systematic list of recently recorded bryophytes. * ELS: recorded by EL Swann (pre-1968).

Species	English name	Latest year	1910
LIVERWORTS (MARCHANTIOPHYTA)			
<i>Lunulariaceae</i>			
<i>Lunularia cruciata</i>	Crescent-cup Liverwort	2003	Y
<i>Marchantiaceae</i>			
<i>Marchantia polymorpha</i>	Common Liverwort	2010	-
<i>Conocephalaceae</i>			
<i>Conocephalum conicum</i>	Great Scented Liverwort	2009	-
<i>Pelliaceae</i>			
<i>Pellia endiviifolia</i>	Endive Pellia	2009	Y
<i>Moerckiaceae</i>			
<i>Moerckia flotoviana</i>		2003	Y
<i>Metzgeriaceae</i>			
<i>Metzgeria furcata</i>	Forked Veilwort	2003	-

Species	English name	Latest year	1910
Aneuraceae			
<i>Aneura pinguis</i>	Greasewort	2007	-
<i>Riccardia chamedryfolia</i>	Jagged Germanderwort	2003	-
Frullaniaceae			
<i>Frullania dilatata</i>	Dilated Scalewort	2010	-
Lophocoleaceae			
<i>Lophocolea bidentata</i>	Bifid Crestwort	2010	Y
<i>Lophocolea heterophylla</i>	Variable-leaved Crestwort	2010	-
<i>Chiloscyphus pallescens</i>	St Winifrid's Other Moss	2003	Y
Calypogeiaceae			
<i>Calypogeia fissa</i>	Common Pouchwort	2003	-
<i>Calypogeia muelleriana</i>	Mueller's Pouchwort	2003	-
MOSSES (BRYOPHYTA)			
Sphagnaceae			
<i>Sphagnum palustre</i>	Blunt-leaved Bog-moss	1995	-
<i>Sphagnum subuitens</i>	Lustrous Bog-moss	2009	-
<i>Sphagnum capillifolium</i>	Acute-leaved Bog-moss	ELS*	-
Polytrichaceae			
<i>Atrichum undulatum</i>	Common Smoothcap	2003	-
Tetraphidaceae			
<i>Tetraphis pellucida</i>	Pellucid Four-tooth Moss	2003	-
Funariaceae			
<i>Funaria hygrometrica</i>	Common Cord-moss	2010	-
<i>Physcomitrium pyriforme</i>	Common Bladder-moss	2010	-
Grimmiaceae			
<i>Grimmia pulvinata</i>	Grey-cushioned Grimmia	2003	Y
Fissidentaceae			
<i>Fissidens adianthoides</i>	Maidenhair Pocket-moss	2010	Y
<i>Fissidens taxifolius</i>	Common Pocket-moss	2003	-
Ditrichaceae			
<i>Ceratodon purpureus</i>	Redshank	2010	Y
Rhabdoweisiaceae			
<i>Dicranoweisia cirrata</i>	Common Pincushion	2003	-
Dicranaceae			
<i>Dicranella varia</i>	Variable Forklet-moss	2010	Y
Leucobryaceae			
<i>Campylopus introflexus</i>	Heath Star Moss	2003	-
Pottiaceae			
<i>Pseudocrossidium hornschiuchianum</i>	Hornschiuch's Beard-moss	2003	-
<i>Barbula convoluta</i> var. <i>convoluta</i>	Lesser Bird's-claw Beard-moss	2010	Y
<i>Barbula unguiculata</i>	Bird's-claw Beard-moss	1995	-
<i>Didymodon fallax</i>	Fallacious Beard-moss	2010	-
<i>Didymodon insulanus</i>	Cylindric Beard-moss	2003	-
<i>Didymodon rigidulus</i>	Rigid Beard-moss	2003	-
<i>Tortula muralis</i>	Wall Screw-moss	2010	-
<i>Syntrichia ruralis</i> var. <i>ruralis</i>	Great Hairy Screw-moss	2010	-
<i>Syntrichia virescens</i>	Lesser Screw-moss	2003	-
<i>Syntrichia laevipila</i>	Small Hairy Screw-moss	2010	Y

Species	English name	Latest year	1910
Orthotrichaceae			
<i>Orthotrichum lyellii</i>	Lyell's Bristle-moss	2010	-
<i>Orthotrichum affine</i>	Wood Bristle-moss	2009	Y
<i>Orthotrichum diaphanum</i>	White-tipped Bristle-moss	2009	Y
<i>Orthotrichum pulchellum</i>	Elegant Bristle-moss	2003	-
<i>Ulota bruchii</i>	Bruch's Pincushion	2009	-
Bryaceae			
<i>Bryum pallens</i>	Pale Thread-moss	2003	-
<i>Bryum capillare</i>	Capillary Thread-moss	2010	Y
<i>Bryum moravicum</i>	Flabby Thread-moss	1995	-
<i>Bryum pseudotriquetrum sens. lat.</i>	Marsh Bryum	2009	-
<i>Bryum pseudotriquetrum var. pseudotriquetrum</i>	Marsh Bryum	2010	Y
<i>Bryum caespiticium</i>	Tufted Thread-moss	2003	-
<i>Bryum argenteum</i>	Silver-moss	2010	Y
<i>Bryum dichotomum</i>	Bicoloured Bryum	2009	-
<i>Bryum rubens</i>	Crimson-tuber Thread-moss	1995	-
Mielichhoferiaceae			
<i>Pohlia melanodon</i>	Pink-fruited Thread-moss	2010	-
Mniaceae			
<i>Mnium hornum</i>	Swan's-neck Thyme-moss	2009	-
Cinclidiaceae			
<i>Rhizomnium punctatum</i>	Dotted Thyme-moss	2003	-
<i>Rhizomnium pseudopunctatum</i>	Felted Thyme-moss	2003	-
Plagiomniaceae			
<i>Plagiomnium affine</i>	Many-fruited Thyme-moss	2010	Y
<i>Plagiomnium elatum</i>	Tall Thyme-moss	2003	-
<i>Plagiomnium undulatum</i>	Hart's-tongue Thyme-moss	2009	-
<i>Plagiomnium rostratum</i>	Long-beaked Thyme-moss	2003	-
Aulacomniaceae			
<i>Aulacomnium palustre</i>	Bog Groove-moss	2003	-
<i>Aulacomnium androgynum</i>	Bud-headed Groove-moss	2010	-
Amblystegiaceae			
<i>Palustriella commutata</i>	Claw-leaved Hook-moss	2007	Y
<i>Cratoneuron filicinum</i>	Fern-leaved Hook-moss	2010	Y
<i>Campylium stellatum</i>	Yellow Starry Feather-moss	2010	Y
<i>Campyliadelphus elodes</i>	Fine-leaved Marsh Feather-moss	2003	Y
<i>Amblystegium serpens</i>	Creeping Feather-moss	2009	Y
<i>Leptodictyum riparium</i>	Kneiff's Feather-moss	2010	-
Calliergonaceae			
<i>Scorpidium cossonii</i>	Intermediate Hook-moss	2009	Y
<i>Scorpidium scorpioides</i>	Hooked Scorpion-moss	2003	Y
<i>Calliergon cordifolium</i>	Heart-leaved Spear-moss	2010	-
<i>Calliergon giganteum</i>	Giant Spear-moss	2010	Y
Leskeaceae			
<i>Leskea polycarpa</i>	Many-fruited Leskea	2010	-
Brachytheciaceae			
<i>Pseudoscleropodium purum</i>	Neat Feather-moss	2010	-
<i>Eurhynchium striatum</i>	Common Striated Feather-moss	2010	-

Species	English name	Latest year	1910
<i>Platyhypnidium riparioides</i>	Long-beaked Water Feather-moss	2003	-
<i>Rhynchostegium confertum</i>	Clustered Feather-moss	2003	-
<i>Oxyrrhynchium hians</i>	Swartz's Feather-moss	2009	-
<i>Oxyrrhynchium speciosum</i>	Showy Feather-moss	2003	-
<i>Kindbergia praelonga</i>	Common Feather-moss	2009	-
<i>Brachythecium albicans</i>	Whitish Feather-moss	2010	-
<i>Brachythecium rutabulum</i>	Rough-stalked Feather-moss	2009	Y
<i>Brachythecium rivulare</i>	River Feather-moss	2010	-
<i>Brachytheciastrum velutinum</i>	Velvet Feather-moss	2003	-
<i>Homalothecium lutescens</i>	Yellow Feather-moss	2010	-
Hypnaceae			
<i>Calliergonella cuspidata</i>	Pointed Spear-moss	2010	Y
<i>Hypnum cupressiforme</i>	Cypress-leaved Plait-moss	2009	-
<i>Hypnum cupressiforme var. resupinatum</i>	Supine Plait-moss	2009	-
<i>Hypnum jutlandicum</i>	Heath Plait-moss	1995	-
<i>Ctenidium molluscum</i>	Chalk Comb-moss	2010	Y
Hylocomiaceae			
<i>Rhytidiadelphus squarrosus</i>	Springy Turf-moss	2009	-
Plagiotheciaceae			
<i>Plagiothecium denticulatum</i>	Dented Silk-moss	2010	-
<i>Plagiothecium nemorale</i>	Woodsy Silk-moss	2003	-
Cryphaeaceae			
<i>Cryphaea heteromalla</i>	Lateral Cryphaea	2010	-
Lembophyllaceae			
<i>Isoetecium alopecuroides</i>	Larger Mouse-tail Moss	2003	-

Charophytes (stoneworts)

Pat Negal

Stoneworts are a group of plants that are generally recognised as forming the family Characeae within the Chlorophyta, the green algae. Worldwide there are approximately two hundred and fifty species of Charophytes; thirty-three of them have been recorded in the UK and Ireland. The database at the Norfolk Biodiversity Information Service holds county records of twenty-two species in the genera *Chara*, *Nitella*, *Nitellopsis* and *Tolypella* dating back to the 1890s. Thirteen species were found in the county during a UEA PhD study carried out in 2004-2005. Three species of *Chara* have been found on Flordon Common.

Charophytes grow submerged in water, anchored to the substrate by rhizoids that are able to produce vegetative propagules known as bulbils. Nutrients are absorbed through the surface of the whole plant. Sexual reproduction is oogamous – the female gametes are fertilized by flagellate male gametes, producing oospores that can remain dormant in the substrate for many years. Many charophytes are normally annuals, their survival depending upon the durability of their spores. The buried spores can germinate quickly after disturbance by dredging, often making charophytes the first colonizers of newly cleared ponds or dykes but they decline as vascular plants become established and as succession proceeds.

The greatest variety of species is found where the water is calcareous. Some species, particularly those of the genus *Chara*, have a metabolism that produces a coating of calcium carbonate on the surface of the plant. The resulting rough texture is most probably the origin of the name 'stonewort'.

Burrell and Clarke recorded two species of charophyte in 1910, *Chara hispida* and *Chara vulgaris*. They dug nine sections in different parts of the Common to investigate the subsoil. One of these, "quite in the middle of the marsh", was just over three feet deep and contained "abundant" plant remains, including *Chara* fruits, throughout.

The next set of known records were made in 2003 when the author collected specimens and his attempts to identify them were checked by N Stewart and J Williamson. Four taxa were confirmed: *Chara aculeolata*; *C. hispida*; *C. vulgaris*, and *Chara vulgaris* var. *longibracteata*. Three visits were made to the Common in 2010 specifically to check whether the 2003 records were still present and to search for other species. No charophytes were found at all. They are known to be susceptible to competition from higher plants and to phosphate and nitrate enrichment of the water in which they grow.

Acknowledgements

Thanks are due to N Stewart and J Williamson for their assistance and for sharing their knowledge and records so freely, and to the Norfolk Biodiversity Information Service and the network of recorders.

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P Negal 'Inishmore', Greenways, Newton Flotman, Norfolk NR15 1QJ

Flordon Common

Diatoms

compiled by *Roy Baker*

Keith Clarke only made two records from Flordon Common. These were collected from the outlet drain in 1987.

Cyclotella kuetzingiaria Thwaites
Cyclotella meneghiniana Kützing.

The latter species is a littoral form occurring in the plankton. It is often the only centric diatom present in the headwaters

of Norfolk rivers. It is characteristic of the metaphyton of plants in marsh dykes.

Reference

CLARKE, KB, 1998. Centric diatoms. *Trans. Norfolk Norwich Nat. Soc.* 31(3): 356.

Dr RE Baker 126, Pelican Row, Norwich Road, Tacolneston, Norwich NR16 1AL

Flordon Common

Lichens

Peter Lambley

The main habitats for lichens now on Flordon Common are on trees and bushes with some on wooden fencing. Burrell and Clarke did not record lichens in their surveys in 1910, neither did Francis Rose on his visit in 1960 so we do not know what was present then or what changes have taken place since. However, aerial photographs in 1946 show very little woodland so that it is likely that there were few lichens present although if there was any fencing present, it would have supported a range of species to judge by evidence from studies on the parish of Mendlesham in Suffolk (Coppins & Lambley 1974).

The current lichen flora is representative of many areas of the wider countryside in

Norfolk in places away from areas of intensive farming. It reflects the change from a sulphur dioxide dominant pollution environment in the 1970s to one where atmospheric nitrogen deposition is having a big impact on the species composition of the lichen communities.

A number of species are relatively new to the Norfolk lichen flora including *Flavoparmelia soledians* which used to be confined to the south of Britain but which now appears to be spreading perhaps as a response to global warming trends. *Punctelia jekeri*, however, is a recently recognised segregate of *Punctelia subrudecta* and was probably always a member of the Norfolk flora. The large Horse Chestnut *Aesculus*

hippocastanum in the drier area supported *Hyperphyscia adglutinata*, which is a species of rather shady dust impregnated bark. This is not a common species in the county. Only one terricolous (on soil) lichen was recorded – *Cladonia fimbriata* on sandy soil on the higher ground.

References

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Acknowledgements

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PW Lambley The Cottage, Elsing Road,
Lyng, Norwch NR9 5RR

Species list

Nomenclature follows Smith et al. (2009).

Species	Substrate
<i>Amandinea punctata</i>	<i>Populus</i> and <i>Aesculus</i>
<i>Arthonia radiata</i>	<i>Fraxinus</i>
<i>Arthonia spadicea</i>	<i>Crataegus</i> in wet area
<i>Candelariella vitellina</i> f. <i>vitellina</i>	wooden fencing
<i>Cladonia fimbriata</i>	sandy soil
<i>Cliostomum griffithii</i>	<i>Fraxinus</i>
<i>Diploicia canescens</i>	<i>Aesculus</i>
<i>Evernia prunastri</i>	<i>Crataegus</i> and <i>Fraxinus</i>
<i>Flavoparmelia caperata</i>	<i>Fraxinus</i>
<i>Flavoparmelia soredians</i>	<i>Fraxinus</i>
<i>Hyperphyscia adglutinata</i>	<i>Aesculus</i>
<i>Lecanora chlarotera</i>	<i>Fraxinus</i>
<i>Lecanora expallens</i>	<i>Fraxinus</i>
<i>Lecanora muralis</i>	wooden fencing
<i>Lecidella elaeochroma</i> f. <i>elaeochroma</i>	
<i>Lepraria incana</i> s. str.	<i>Crataegus</i>
<i>Melanelixia subaurifera</i>	<i>Fraxinus</i>
<i>Parmelia sulcata</i>	
<i>Phaeophyscia orbicularis</i>	<i>Populus</i> and <i>Salix</i>
<i>Phlyctis argena</i>	<i>Fraxinus</i>
<i>Physcia adscendens</i>	<i>Populus</i>

Species	Substrate
<i>Physcia tenella</i> subsp. <i>tenella</i>	<i>Populus</i> and <i>Fraxinus</i>
<i>Physconia grisea</i>	<i>Populus</i> and <i>Salix</i>
<i>Punctelia jeckeri</i>	
<i>Punctelia subrudecta</i> s. str.	<i>Salix</i>
<i>Ramalina farinacea</i>	<i>Populus</i>
<i>Xanthoria parietina</i>	<i>Populus</i> , <i>Salix</i> and <i>Fraxinus</i>

Flordon Common

Fungi

Tony Leech

The number of fungus species recorded from a site depends not only on the habitats present but the interests and expertise of recorders and the frequency of their visits. With these provisos it is unlikely that the 167 species of fungus (and related groups) currently recorded from Flordon Common represent anything like the total number of species present. Wet sites generally have few large fungus species, and mycological interest at Flordon depends mainly on the small area of dry grazed turf, the alder woods and on host-specific parasites and saprotrophs.

All of the recent (post-2007) records, and probably most or all of the historical records, are from the part of the Common now designated an SSSI. Some of the early records are from Flordon rather than Flordon Common but it is likely that they do refer to the Common. The earliest records, from the 1930s, made by EA (Ted) Ellis, are all of microfungi, many of them plant parasites. Between 1977 and 1993 Reg and Lil Evans added a further 48 species from various groups, including four first Norfolk records (*Entoloma euchroum*, *Eutypa spinosa*, *Phellinus igniarius* and *Stilbella fimetaria*). In the summer of 2008 the Suffolk Fungus Group visited the site and in November 2009 Alec Bull identified 48 species from the Common. Several visits from other members of the Norfolk Fungus Study Group added further records in 2009 and 2010. A total of seven species has been added to the Norfolk list from Flordon Common since 2007.

Noteworthy species

Although Burrell & Clarke did not record any fungi from the Common in 1910 they did refer to a myxomycete (slime-mould)

from Flordon which had not hitherto been recorded in Britain, namely *Chondrioderma asteroides*, on Marsh Horsetail *Equisetum palustre*. The species is now referred to as *Diderma asteroides* and remains rare in Britain with only twelve British records. According to Bruce Ing (pers. comm.) this species is characteristic of litter under thick-leaved evergreen trees and shrubs, and is more frequently found in southern Europe.

An early record by Ted Ellis was of *Paecilomyces fumosoroseus*, a mould found on a (presumably dead) Glow-worm *Lampyrus noctiluca*. Although this is the only record for the species on the Norfolk Fungus Database Ted Ellis reports finding it at a number of other Norfolk sites (Ellis 1955). There are still few records for this species elsewhere in Britain. This fungus has been developed commercially for the biological control of pest insects, including whitefly. A second entomogenous fungus with a number of Norfolk records but rare outside the county is *Nomuraea rileyi*, found at Flordon by Stuart Paston in 1984.

In June 2008, Neil Mahler found a particularly well-coloured clump of Lilac Oysterling *Panus conchatus* on an ash stump (see photo p. 23). It is fairly widespread in Britain but no records exist for this species on the Norfolk Fungus Database, although on the national database (Fungus Records Database of Britain and Ireland, managed by the British Mycological Society) there are two old records for the county, made on consecutive days in October 1926, from Westwick and Stratton Strawless. Conversely, another lilac agaric, *Lactarius lilacinus*, found by Alec Bull, is known from a number of different alder carrs in Norfolk

but is nationally rather scarce. Although alder woods support relatively few fungal species, a further two, found recently, are of some interest: *Cortinarius alnetorum*, also found by Alec Bull, is a nationally scarce species and Alder Tongue *Taphrina alni*, a distinctive gall-causer found by Janet Negal, has few recent Norfolk records.

Recent additions to the county list from Flordon include: *Pluteus griseoluridus*, a pink-spored agaric and *Sphaerotheca epilobii*, a powdery mildew on Greater Willow-herb *Epilobium hirsutum*. Three further new county records are of fungi appearing on pony dung collected on the Common: *Coprinopsis cordisporus*, *Sporormiella grandispora* and *Lasiobolus ciliatus*. Sadly, the pony

has since died. Incubated Rabbit dung produced *Coprotus ochraceus*, a further species new to the county.

Acknowledgements

The following have found or identified specimens during the present study: Peter Aspinall, Alec Bull, Trevor Dove, Rex and Barbara Hancy, Tony Leech, Janet Negal, Neil Mahler and Stuart Paston.

Reference

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Dr AR Leech 3 Eccles Road, Holt, Norfolk NR25 6HJ

Species list

Species	English name	Habitat	Year
Basidiomycetes: Agarics			
<i>Agaricus silvicola</i>	Wood Mushroom	Woodland	2010
<i>Agaricus subperonatus</i>		Soil	1995
<i>Amanita rubescens</i>	Blusher	Woodland	2009
<i>Armillaria mellea</i> s.l.	Honey Fungus	Dead wood	2009
<i>Bolbitius titubans</i>	Yellow Fieldcap	Grassland	2008
<i>Boletus chrysenteron</i>	Red-cracking Bolete	Woodland	2010
<i>Calocybe carnea</i>	Pink Domecap	Grassland	2010
<i>Clitocybe gibba</i>	Common Funnel	Woodland	2009
<i>Clitocybe rivulosa</i>	Fool's Funnel	Grassland	2010
<i>Clitopilus prunulus</i>	The Miller	Grassland	1977
<i>Collybia maculata</i>	Spotted Toughshank	Woodland	1993
<i>Conocybe tenera</i>		Woodland	2009
<i>Coprinellus disseminatus</i>	Fairy Inkcap	Dead wood	2009
<i>Coprinellus micaceus</i>	Glistening Inkcap	Dead wood	2009
<i>Coprinellus radians</i>		Dead wood	2010
<i>Coprinopsis atramentaria</i>	Common Inkcap	Grassland	2009
<i>Coprinopsis cordispora</i>		Dung	2010
<i>Coprinopsis lagopus</i>	Hare'sfoot Inkcap	Woodland	2009
<i>Coprinopsis radiata</i>		Dung	2010
<i>Cortinarius alnetorum</i>		Woodland	2009
<i>Cortinarius decipiens</i>	Sepia Webcap	Woodland	2010
<i>Cortinarius triumphans</i>	Birch Webcap	Woodland	2009
<i>Crepidotus cesatii</i>		Dead wood	2009
<i>Crepidotus variabilis</i>	Variable Oysterling	Dead wood	2009
<i>Entoloma euchroum</i>		Woodland	1977
<i>Entoloma hebes</i>	Pimple Pinkgill	Woodland	2009
<i>Entoloma sericeum</i>	Silky Pinkgill	Grassland	2009

Species	English name	Habitat	Year
<i>Entoloma undatum</i>		Grassland	2010
<i>Flammulina velutipes</i>	Velvet Shank	Dead wood	2009
<i>Galerina clavata</i>		Grassland	2009
<i>Galerina laevis</i>		Grassland	2009
<i>Hebeloma pusillum</i>		Mire	2009
<i>Hygrocybe coccinea</i>	Scarlet Waxcap	Grassland	2010
<i>Hygrocybe conica</i>	Blackening Waxcap	Grassland	2009
<i>Hygrocybe miniata</i>	Vermilion Waxcap	Grassland	1993
<i>Hygrocybe pratensis</i>	Meadow Waxcap	Grassland	1977
<i>Hygrocybe virginea</i>	Snowy Waxcap	Grassland	2010
<i>Hypholoma fasciculare</i>	Sulphur Tuft	Dead wood	2009
<i>Inocybe rimosa</i>	Split Fibrecap	Woodland	2009
<i>Laccaria amethystina</i>	Amethyst Deceiver	Woodland	1993
<i>Laccaria laccata</i>	Deceiver	Woodland	1993
<i>Lactarius lilacinus</i>		Woodland	2009
<i>Lactarius pyrogalus</i>	Fiery Milkcap	Woodland	2010
<i>Lentinus tigrinus</i>		Dead wood	2009
<i>Lepiota cristata</i>	Stinking Dapperling	Woodland	2009
<i>Leucopaxillus giganteus</i>	Giant Funnel	Woodland	1977
<i>Mycena acicula</i>	Orange Bonnet	Woodland	2009
<i>Mycena adscendens</i>	Frosty Bonnet	Woodland	2010
<i>Mycena aetites</i>	Drab Bonnet	Grassland	2009
<i>Mycena archangeliana</i>	Angel's Bonnet	Dead wood	2009
<i>Mycena galericulata</i>	Common Bonnet	Dead wood	2010
<i>Mycena luteoalba</i>	Ivory Bonnet	Grassland	2009
<i>Mycena speirea</i>	Bark Bonnet	Dead wood	2009
<i>Mycena vitilis</i>	Snapping Bonnet	Woodland	2009
<i>Naucoria escharioides</i>	Ochre Aldercap	Woodland	2009
<i>Naucoria scolecina</i>		Woodland	2009
<i>Naucoria subconspersa</i>		Woodland	2009
<i>Panaeolina foenicisii</i>	Brown Mottlegill	Grassland	2008
<i>Panaeolus papilionaceus</i>	Petticoat Mottlegill	Grassland	1993
<i>Panaeolus semiovatus</i>	Egghead Mottlegill	Dung	1977
<i>Panus conchatus</i>	Lilac Oysterling	Dead wood	2008
<i>Parasola misera</i>		Dung	2010
<i>Parasola plicatilis</i>	Pleated Inkcap	Grassland	2009
<i>Paxillus involutus</i>	Brown Rollrim	Woodland	1977
<i>Pholiota aurivella</i>	Golden Scalycap	Dead wood	2009
<i>Pholiota squarrosa</i>	Shaggy Scalycap	Dead wood	1993
<i>Pluteus cervinus</i>	Deer Shield	Dead wood	2010
<i>Pluteus griseoluridus</i>		Dead wood	2009
<i>Pluteus romellii</i>	Goldleaf Shield	Dead wood	2009
<i>Pluteus salicinus</i>	Willow Shield	Dead wood	2009
<i>Psathyrella candolleana</i>	Pale Brittlestem	Woodland	2009
<i>Psathyrella corrugis</i>	Red Edge Brittlestem	Woodland	2009
<i>Russula gracillima</i>	Slender Brittlestem	Woodland	1993
<i>Tubaria dispersa</i>		Dead plant	2009
<i>Tubaria furfuracea</i>	Scurfy Twiglet	Dead wood	2009
<i>Xerula radicata</i>	Rooting Shank	Grassland	2010

Species	English name	Habitat	Year
Basidiomycetes: Brackets and Resupinates			
<i>Abortiporus biennis</i>	Blushing Rosette	Dead wood	2009
<i>Bjerkandera adusta</i>	Smoky Bracket	Dead wood	1977
<i>Byssomerulius corium</i>	Netted Crust	Dead wood	2008
<i>Choudrostereum purpureum</i>	Silverleaf Fungus	Dead wood	2009
<i>Coniophora puteana</i>	Wet Rot	Dead wood	1977
<i>Ganoderma australe</i>	Southern Bracket	Dead wood	2009
<i>Hyphodontia sambuci</i>	Elder Whitewash	Dead wood	2009
<i>Inouotus radiatus</i>	Alder Bracket	Dead wood	2009
<i>Mycoacia uda</i>		Dead wood	1977
<i>Phellinus pomaceus</i>	Cushion Bracket	Dead wood	2008
<i>Phellinus ferreus</i>	Cinnamon Porecrust	Dead wood	2010
<i>Phellinus igniarius</i>	Willow Bracket	Dead wood	1977
<i>Physiosporinus sanguinolenta</i>	Bleeding Porecrust	Dead wood	2009
<i>Piptoporus betulinus</i>	Birch Polypore	Dead wood	2009
<i>Polyporus brumalis</i>	Winter Polypore	Dead wood	2010
<i>Polyporus durus</i>	Bay Polypore	Dead wood	2009
<i>Polyporus squamosus</i>	Dryad's Saddle	Dead wood	1977
<i>Schizopora paradoxa</i>	Split Porecrust	Dead wood	1977
<i>Stereum hirsutum</i>	Hairy Curtain Crust	Dead wood	2009
<i>Stereum rugosum</i>	Bleeding Broadleaf Crust	Dead wood	1977
<i>Trametes pubescens</i>		Dead wood	2010
<i>Trametes versicolor</i>	Turkeytail	Dead wood	2009
<i>Vuilleminia comedens</i>	Waxy Crust	Dead wood	2008
Basidiomycetes: Gasteromycetes			
<i>Bovista nigrescens</i>	Brown Puffball	Grassland	2009
<i>Bovista plumbea</i>	Grey Puffball	Grassland	2010
<i>Calvatia gigantea</i>	Giant Puffball	Grassland	2010
<i>Geastrum triplex</i>	Collared Earthstar	Woodland	2009
<i>Lycoperdon lividum</i>	Grassland Puffball	Grassland	2009
<i>Lycoperdon molle</i>	Soft Puffball	Grassland	2009
<i>Lycoperdon nigrescens</i>	Dusky Puffball	Woodland	2009
<i>Scleroderma verrucosum</i>	Scaly Earthball	Woodland	2009
<i>Vascellum pratense</i>	Meadow Puffball	Grassland	2010
Basidiomycetes: Jelly Fungi			
<i>Auricularia auricula-judae</i>	Jelly Ear	Dead wood	2009
<i>Auricularia mesenterica</i>	Tripe Fungus	Dead wood	1977
<i>Calocera cornea</i>	Small Stagshorn	Dead wood	2009
<i>Dacrymyces stillatus</i>	Common Jellyspot	Dead wood	2009
<i>Tremella mesenterica</i>	Yellow Brain	Dead wood	2009
Basidiomycetes: Rusts and Smuts			
<i>Microbotryum stellariae</i>		Living plant	2009
<i>Phragmidium violaceum</i>	Violet Bramble Rust	Living plant	2009
<i>Puccinia angelicae</i>		Living plant	1941
<i>Puccinia calthicola</i>		Living plant	1941
<i>Puccinia conii</i>		Living plant	1932
<i>Puccinia dioicae</i> var. <i>dioicae</i>		Living plant	1935
<i>Puccinia glechomatis</i>		Living plant	2009

Species	English name	Habitat	Year
<i>Puccinia menthae</i>		Living plant	1934
<i>Puccinia phragmitis</i>		Living plant	1934
<i>Puccinia poarum</i>		Living plant	1977
<i>Puccinia pulverulenta</i>		Living plant	2010
<i>Uromyces junci</i>		Living plant	2009
Ascomycetes: Discomycetes			
<i>Aleuria aurantia</i>	Orange Peel Fungus	Grassland	2010
<i>Cheilymenia fimicola</i>		Dung	2010
<i>Ciboria cancus</i>	Alder Cup	Dead plant	2010
<i>Coprotus ochraceus</i>		Dung	2010
<i>Humaria hemisphaerica</i>	Glazed Cup	Soil	1977
<i>Lasiobolus ciliatus</i>		Dung	2010
<i>Sarcoscypha austriaca</i>	Scarlet Elfcup	Woodland	2010
<i>Symphosirenia angelicae</i>		Dead plant	2010
<i>Tapesia fusca</i>		Dead wood	2010
<i>Tazetta catinns</i>		Soil	1977
<i>Tazetta cupularis</i>	Toothed Cup	Soil	2009
<i>Trochila craterium</i> [F]		Living plant	1935
Ascomycetes: other			
<i>Camarops lutea</i>		Dead wood	1977
<i>Cladosporium epiphyllum</i> [F]		Dead plant	1935
<i>Daldinia concentrica</i>	King Alfred's Cake	Dead wood	2009
<i>Diaporthe incarcerationata</i> [F]		Dead wood	1935
<i>Diatrype bnllata</i>	Willow Barkspot	Dead wood	2009
<i>Diatrypella quercina</i>		Dead wood	2009
<i>Discostroma corticola</i> [F]		Dead wood	1935
<i>Entypa spinosa</i>		Dead wood	1977
<i>Hypomyces aurantius</i>		Dying fungi	2009
<i>Hypoxylon fuscum</i>	Hazel Woodward	Dead wood	2010
<i>Hypoxylon multiforme</i>	Birch Woodward	Dead wood	2010
<i>Leptosphaeria acuta</i>	Nettle Rash	Dead wood	2010
<i>Leptosphaeria coniothyrium</i> [F]		Dead wood	1935
<i>Melanomma pulvis-pyrus</i> [F]		Dead wood	1935
<i>Nectria cinnabarina</i>	Coral Spot	Dead wood	2009
<i>Nectria episphaeria</i> [F]		Dead wood	1935
<i>Nomuraea rileyi</i>		Dead insect	1984
<i>Paecilomyces fumosoroseus</i>		Dead insect	1952
<i>Rhytisma acerinum</i>	Tar Spot	Living plant	2009
<i>Sphaerotheca epilobii</i>		Living plant	2009
<i>Sphaerulina rehmanniana</i> [F]		Living plant	1935
<i>Sporormiella grandispora</i>		Dung	2010
<i>Stilbella fimetaria</i>		Dung	1977
<i>Taphrina alni</i>	Alder Tongue	Living plant	2009
<i>Xylaria hypoxylon</i>	Candlesnuff Fungus	Dead wood	2009
<i>Xylaria longipes</i>	Dead Moll's Fingers	Dead wood	2010
Myxomycetes			
<i>Diderma asteroides</i>		Leaf litter	1910
<i>Didymium difforme</i>		Leaf litter	1977

Species	English name	Habitat	Year
<i>Mucilago crustacea</i>		Grassland	2010
Chytridiomycetes			
<i>Physoderma menthae</i>		Gall	2010

Notes

Scientific names are as in the Checklist of British Fungi (www.fieldmycology.net)

[F] indicates that the record is from Flordon, rather than specifically from Flordon Common. The habitat given is either where the fungus was actually found, or, in the case of some historical records, where it was most likely to have been found. The date is that of the most recent record.

Flordon Common

Galls

Rex Hancy

The following list represents a fraction of the plant galls almost certainly present on such a richly varied habitat. The most easily accessible part of the Common by the entrance demonstrated the possibilities for further exploration.

Plant galls are caused by a wide range of outside agents acting on specific hosts to carry out their reproductive processes. Typically, a female gall-wasp lays an egg or eggs in a bud, flower or stem and the host plant grows extra tissue in a distinctively recognisable form. The larvae, bacteria, fungal spores develop inside the gall and feed on the extra tissue provided by the host. It is the feeding on the tissue which differentiates a true gall from other kinds extra growth which usually form in less consistent and recognisable form. A gall record therefore demands three parts, the names of the gall causer and the host plant plus a brief description of the gall itself.

Most of the plant galls listed are frequently recorded in the county. The three excep-

tions are the two on Water Mint *Mentha aquatica* and that on Fleabane *Pulicaria dysenterica*. The last is a relative newcomer to Norfolk with few records to date.

Much research and reclassification has gone on during recent years. However, for consistency and ease of reference this list follows the work of The British Plant Gall Society (Redfern & Shelley 2002).

References

REDFERN, M & SHIRLEY, P (Eds.), 2002. Identification of Galls on Plants and Fungi. *Field Studies* 10: 207-531.

R Hancy 124 Fakenham Road, Taverham, Norwich NR8 6QH

Species list

FUNGI

Puccinia glechomatis on Ground Ivy *Glechoma hederacea*. Lower leaf surface and petiole with brown fungal spots.

Puccinia pulverulenta on *Epilobium* sp. Puckered, yellowing leaves. Raised areas with orange aecia underneath.

Physoderma menthae on Water Mint *Mentha aquatica*. Thick pustules on stems and leaves with golden

sporangia.

ACARI - Eriophyoidea – gall mites

Aceria macrochelus on Field Maple *Acer campestre*.

Rounded, hard walled gall 2-4 mm by vein mid-rib angles on upper surface of leaf.

Aculus hippocastani on Horse Chestnut *Aesculus hippocastanum*. Reddish, persistent tufts in vein/midrib angles on lower surface of leaf

Eriophyes inangulis on Alder *Alnus glutinosa*. Rounded pouch in vein angles on upper leaf surface.

Eriophyes laevis on Alder *Alnus glutinosa*. Small, rounded patches scattered over leaf blade.

Phyllocoptes goniothorax on Hawthorn *Crataegus monogyna*. Very tightly rolled leaf edges.

Aceria megacerus on Water Mint *Mentha aquatica* (see photo p. 20). Leaves at shoot tip deformed and hairy.

Eriophyes prunispinosae on Blackthorn *Prunus spinosa*. Small pouches along leaf edge.

Aculus laevis on Sallow *Salix* sp. Small pustules 1-2 mm on upper leaf surface.

HEMIPTERA - Psylloidea – psyllids

Psyllopsis fraxini on Ash *Fraxinus excelsior*. Inrolled leaflets, highly coloured.

DIPTERA – Cecidomyiidae – gall midges

Dasineura ulmaria on Meadowsweet *Filipendula ulmaria*. Pustules on upper leaf surface, cones below.

Dasineura pustulans on Meadowsweet *Filipendula ulmaria*. Small swellings within yellow patches on leaf upper surface

Rondaniola bursaria on Ground Ivy *Glechoma hederacea*. Lighthouse Gall. Green, turning red.

Myopites inulaedysentericae on Fleabane *Pulicaria dysenterica* (see photo p. 23). Swollen capitula.

Iteomyia major on Sallow *Salix* sp. . Hard, irregular swellings along midrib, more pronounced on lower surface.

Dasineura urticae on Common Nettle *Urtica dioica*. Pale swellings on midrib/petiole.

Jaapiella veronicae on Germander Speedwell *Veronica chaemaedrys*. Terminal leaves thickened into hairy pouch

Schizomyia gallorum on Marsh Bedstraw *Galium palustrum*. Flower remains closed and swollen.

DIPTERA – Chloropidae

Lipara lucens on Common Reed *Phragmites communis*. Cigar Gall.

DIPTERA – Tephritidae

Urophora cardui on Creeping Thistle *Cirsium arvense*. Large ovoid swelling in stem.

HYMENOPTERA – Tenthredinidae – sawflies

Pontania bridgemanii on sallow *Salix* sp. Irregular bean gall on lower leaf surface.

HYMENOPTERA – Cynipidae – gall-wasps

Diplolepis rosae on rose *Rosa* sp. Rose Bedeguar Gall; Robin's Pin-cushion

The following were found on Pedunculate Oak *Quer-*

cus robur. Note that the majority of galls on oak are induced by cynipid wasps, many species of which have a bizarre life cycle of two quite different generations. One of the generations produces both male and female wasps. This is the sexual (Sx) generation. The alternate generation produces all females, the agamic (Ag) generation.

Andricus curvator (Sx). Globular swelling in distorted leaf blade.

Andricus lignicola (Ag). Hard, rough and roundish gall replacing bud.

Andricus quercuscalicis (Ag). Knopper Gall in acorn cup.

Biorhiza pallida (Sx). Oak Apple gall replacing terminal bud.

Neuroterus anthracinus (Ag). Ovoid Oyster Gall on leaf midrib between flaps of tissue.

Neuroterus quercusbaccarum (Ag). Common Spangle Gall on lower leaf surface.

Neuroterus albipes (Ag). Smooth, hairless cup shaped on lower leaf surface.

Neuroterus numismalis (Ag). Silk-button Spangle Gall.

Mammals

Peter Aspinall & Stuart Newson

Daily checklist recording and incidental records

Since May 2009, PA has recorded the presence of each mammal species seen on Flordon Common on a daily basis¹. These data are particularly good for large easily detectable mammal species, where it is possible to examine how the apparent presence of species varies over the year. To illustrate, Figure 1 shows the proportion of days in each month that recorded the presence of Roe Deer *Capreolus capreolus* and Reeves' Muntjac *Muntiacus reevesi*. Whilst the pattern is not completely consistent across three months where two years of data are available, this figure is likely to reflect changes in species detectability over the year rather than a change in the use of the Common by these species. During July to October for example, concealing ground cover is likely to have reduced the probability of detecting these species. Records of Roe Deer in July and August probably relate to increased activity during the rut-

ting period. The recorded presence of both species then increases as ground cover is reduced from November, with a fall in recorded presence of Roe Deer in February and March, perhaps as this species make less use of the Common at this time of year, or a consequence of decreased activity with a reduced metabolic rate during the winter, resulting in fewer detections at this time.

In addition, these checklist data along with additional incidental observations, provide valuable records of species which are not monitored through small mammal trapping or bat recording discussed below (see Species List). Of these species, probably the most notable are Water Vole *Arvicola terrestris* and Water Shrew *Neomys fodiens*, although in recent years the latter has only been recorded just outside the boundary of the Common.

Small mammal trapping

To try and get a better idea of the small mammal species present on Flordon Common, a simple survey was designed where

¹ Excluding four days of holiday in September 2009.

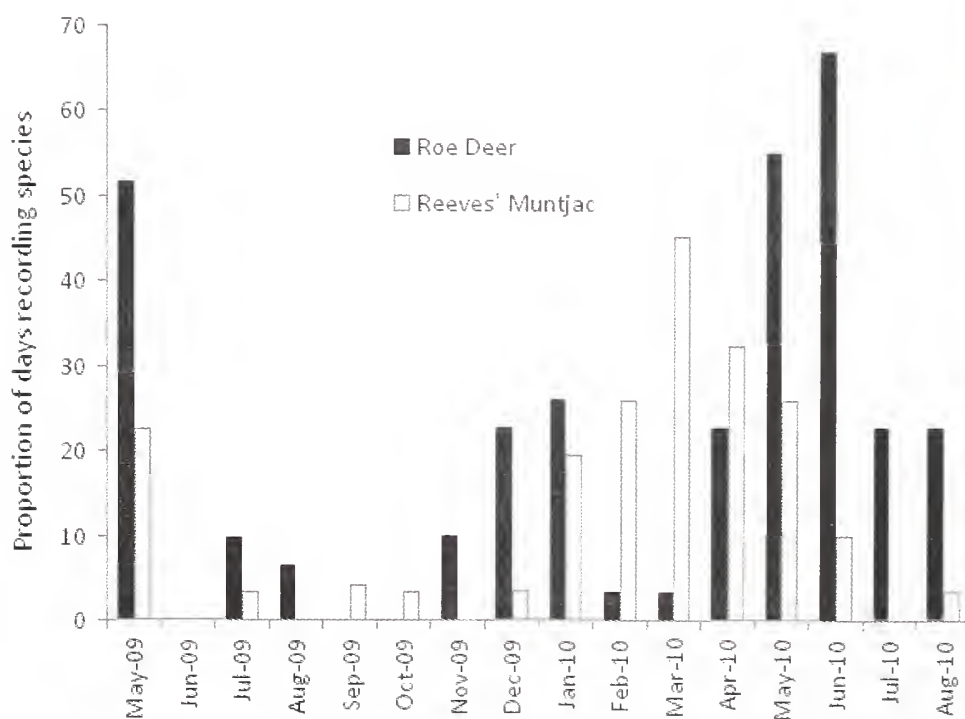
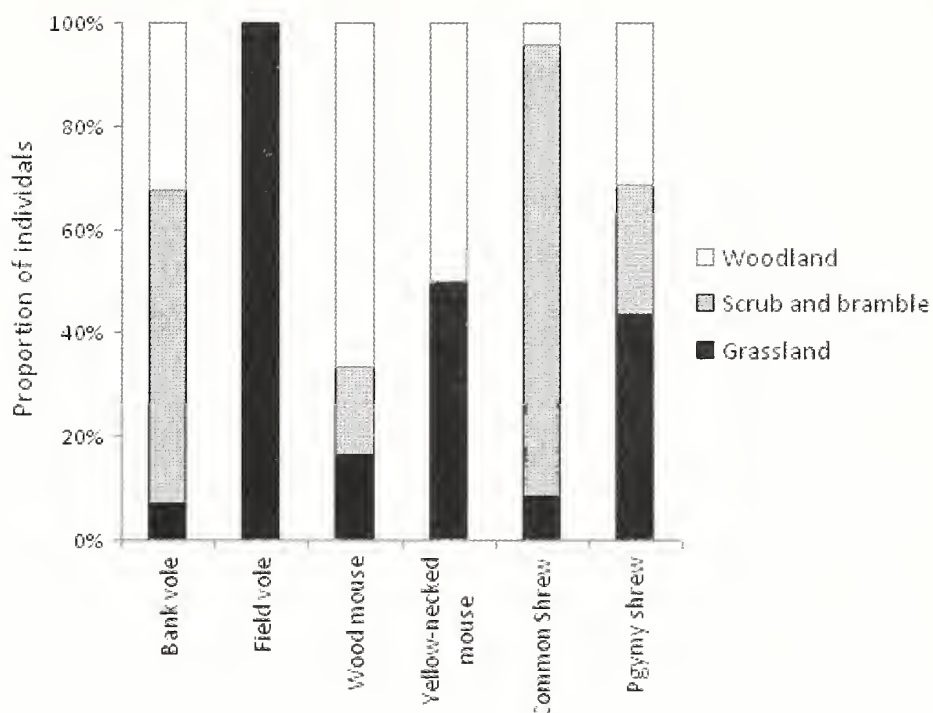


Figure 1. Proportion of days in each month in which Roe Deer and Reeves' Muntjac were recorded.

Figure 2. Proportion of small mammals of each species trapped in woodland, scrub and bramble, and grassland controlling for trapping effort in each broad habitat type.



20-50 Longworth traps were put out on the Common over six trapping days and nights between the 16 and 28 April 2010. To the best of our knowledge, small mammal trapping had not previously been carried out on the Common. During the survey, the locations of the traps were moved to make sure that the survey covered habitats present on the Common which could support different assemblages of small mammal species. These habitats were later grouped into three broad categories: grassland, woodland and scrub / bramble.

Longworth traps were supplied with hay bedding and baited with mixed seed, grapes as a water source and dried meal worms (for shrews). The traps were checked every four hours as a precaution in case shrews were present.

A total of 115 small mammals of six species were trapped, of which Bank Vole *Myodes glareolus* (n = 55) was the most commonly trapped species. This was followed by Common Shrew *Sorex araneus* (n = 25), Pygmy Shrew *Sorex minutus* (n = 20), Wood Mouse *Apodemus sylvaticus* (n = 10), Field Vole *Microtus agrestis* (n = 3) and Yellow-necked Mouse *Apodemus flavicollis* (n = 2). Of these, the most notable record is Yellow-necked Mouse which appears to be highly localised in Norfolk, although is probably under-recorded in the county. Examining

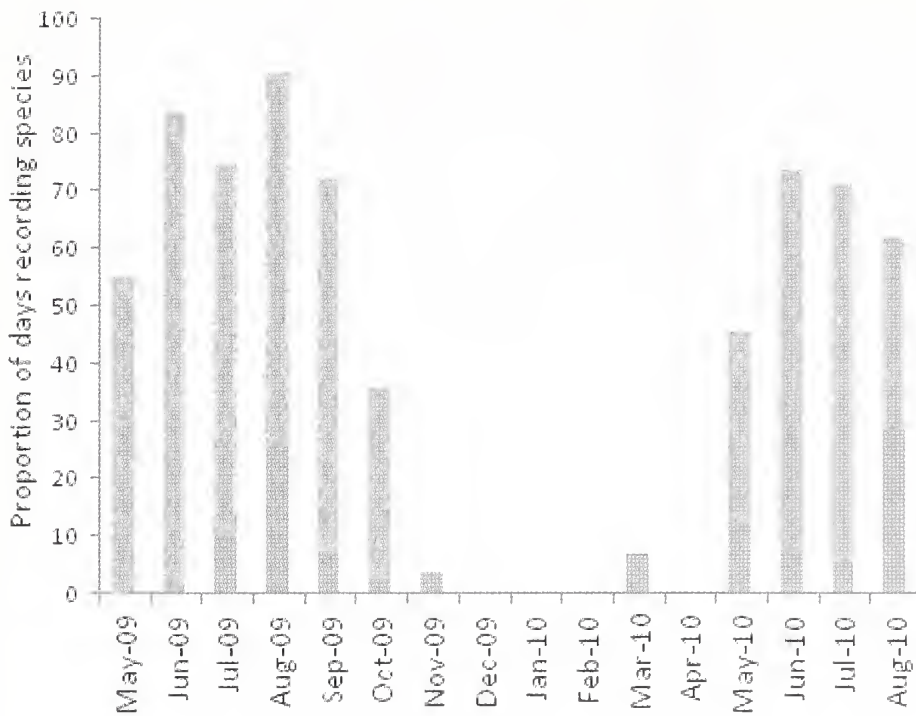
the proportion of records of each small mammal species according to habitat, suggests that species densities are likely to vary according to broad habitat (Figure 2).

Bat recording

As part of PAs checklist recording, the presence / 'absence' of foraging bats has been recorded on a daily basis (Figure 3). This is interesting in that provides information on the timing of spring emergence and hibernation of bats using the Common, but at the same time it has been frustrating not to know what species were involved.

Thanks to Norwich Bat Group (www.norwichbatgroup.org.uk), an extremely popular bat walk, with more than 30 people taking part, was held on Flordon Common on the 30 June 2010. This walk confirmed the presence of Common Pipistrelle *Pipistrellus pipistrellus* and Soprano Pipistrelle *Pipistrellus pygmaeus*, whilst Noctule *Nyctalus noctula* and Natterer's Bat *Myotis nattererii* were possibly detected, but were unconfirmed. Following on from this, an Anabat™ bat detector was left securely overnight on the Common over thirteen nights between 16 July and 17 October 2010 to make remote recordings of bat calls. This system simplifies bat monitoring by picking up and writing calls to a Compact Flash card within the unit for later analysis on a computer. Whilst

Figure 3. Proportion of days in each month in which bats were recorded.



Common and Soprano Pipistrelles were by far the most common species recorded on Flordon Common (Figure 4), the Anabat™ also confirmed the presence of a number of other species at low density including Barbastelle *Barbastella barbastellus*, Noctule, Serotine *Eptesicus serotinus*, Natterer's, Brown Long-eared Bat *Plecotus aruitus*. A couple of Anabat files of the genus *Myotis* were tentatively identified as Daubenton's *Myotis daubentonii*. A recording of a possible Nathusius' Pipistrelle *Pipistrellus nathusii* remained unconfirmed.

Acknowledgements

We are extremely grateful to Sam Phillips for his enthusiastic support and advice on bat identification. Our thanks go to Michelle Fielden and Catherine Greenhough for leading a bat walk on Flordon Common on behalf of Norwich Bat Group, and to the many people who gave up their evening to join us on the walk. We thank Rachel Saunders, Richard Saunders and Lucy Snow for their advice and help with small mammal trapping, and Janet Negal for her support

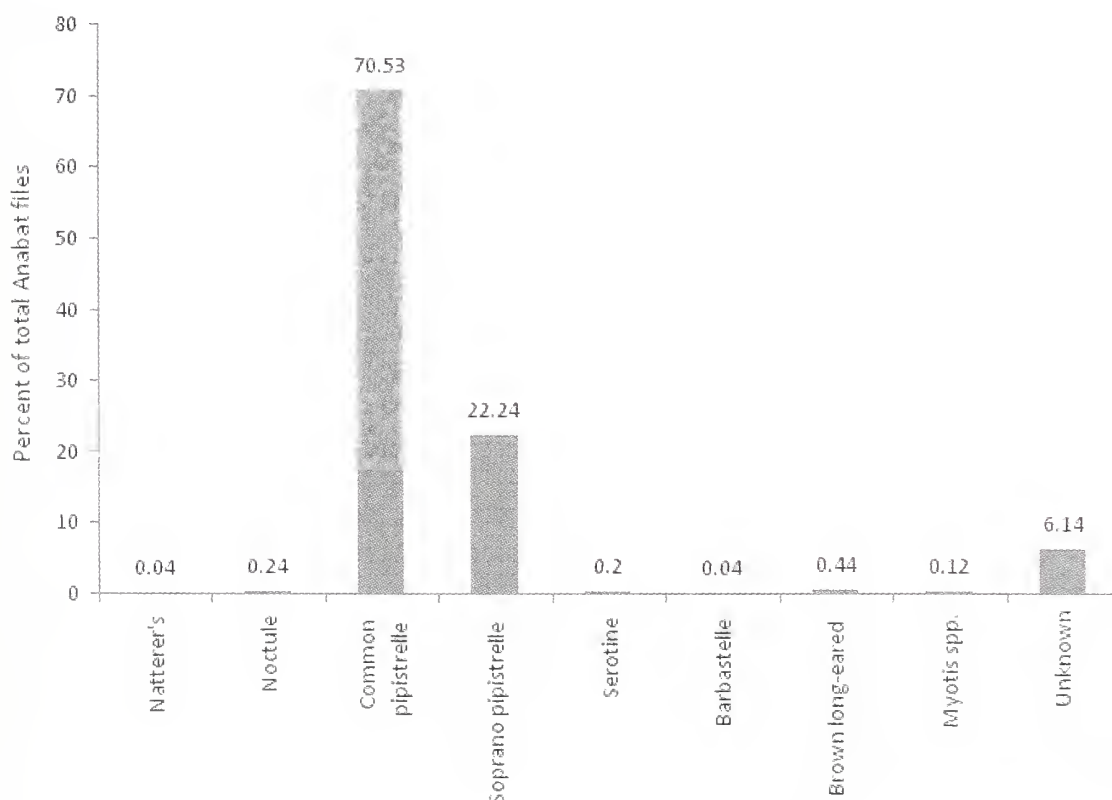


Figure 4. Percentage of total Anabat files recording each bat species on Flordon Common over 13 nights between 16 July and 17 October 2010.

throughout. Our thanks also go to The Ecology Consultancy (www.ecologyconsultancy.co.uk) for the loan of, and support in the use of an Anabat bat detector. We are grateful to Catherine Greenhough for helping to confirm the identification of several bat species and to Dave Leech and the

Norfolk and Norwich Naturalists' Society for the loan of Longworth traps.

P Aspinall Harvey House, Norwich Road, Flordon, Norwich, NR15 1RX

SE Newson Stone House, Norwich Road, Hapton, Norwich, NR15 1RZ

Species list. Mammals recorded on Flordon Common in 2009/2010 and in 1910 by Burrell & Clarke. [Rare = < 10 records a year].

Species	Status 2009 / 2010	Status 1910
Rodentia		
Grey Squirrel <i>Sciurus carolinensis</i>	All year	Absent
Bank Vole <i>Myodes glareolus</i>	All year	?
Field Vole <i>Microtus agrestis</i>	All year	All year
Water Vole <i>Arvicola terrestris</i>	All year (?) / rare	All year
Wood Mouse <i>Apodemus sylvaticus</i>	All year	?
Yellow-necked Mouse <i>Apodemus flavicollis</i>	All year	?
Brown Rat <i>Rattus norvegicus</i>	All year	?
Lagomorpha		
Rabbit, <i>Oryctolagus cuniculus</i>	All year	All year
Brown Hare <i>Lepus europaeus</i>	Outside boundary	All year
Erinaceomorpha		
Hedgehog <i>Erinaceus europaeus</i>	Summer	?
Soricomorpha		
Mole <i>Talpa europaea</i>	All year	All year
Common Shrew <i>Sorex araneus</i>	All year	?
Pygmy Shrew <i>Sorex minutus</i>	All year	?
Water Shrew <i>Neomys fodiens</i>	Outside boundary	Reported in EDP in 1970
Chiroptera		
Serotine <i>Eptesicus serotinus</i>	Summer	?
Noctule <i>Nyctalus noctula</i>	Summer	?
Common Pipistrelle <i>Pipistrellus pipistrellus</i>	Summer	?
Soprano Pipistrelle <i>Pipistrellus pygmaeus</i>	Summer	?
Brown Long-eared Bat <i>Plecotus arnitus</i>	Summer	?
Barbastelle <i>Barbastella barbastellus</i>	Summer	?
Natterer's <i>Myotis nattererii</i>	Summer	?
<i>Myotis</i> sp. (probably Daubenton's Bat <i>Myotis daubentonii</i>)	Summer	?
Carnivora		
Red Fox <i>Vulpes vulpes</i>	All year	?
Stoat <i>Mustela erminea</i>	All year	?
Weasel <i>Mustela nivalis</i>	Outside boundary	?
Artiodactyla		
Reeves' Muntjac <i>Muntiacus reevesi</i>	All year	Absent
Roe Deer <i>Capreolus capreolus</i>	All year	Probably absent

Birds

Stuart Newson

Territory mapping and incidental records through the year

To obtain a baseline estimate of the number of breeding territories of bird species present on Flordon Common in 2009 and 2010, against which future change could be compared, a standardised territory mapping approach was used. Ten visits were made to the Common in both years between early April and late June to map the locations of all individuals detected on each visit. To coincide with maximum bird activity, all visits were made between 06:00 and 09:00 hours GMT, and avoided mornings with wet or windy weather. Records were subsequently collated into a single map for each year, and individual territories of birds were identified by looking at the clusters of records of each species. Because it is thought that coverage of some parts of the Common was poor, I present the number of breeding territories in each year here as minimum estimates (Table 1). Additional approximately bi-weekly visits to the Common between September 2007 and July 2010 by SN, records provided by Peter Aspinall and bird ringing on Flordon Common and neighbouring land (discussed below) provided further information on the use of the Common by these and other species through the year (Table 1). Whilst none of the breeding bird species of Flordon Common are exceptional for the county, the inventory includes three red-listed species (Cuckoo *Cuculus canorus*, Turtle Dove *Streptopelia turtur* and Song Thrush *Turdus philomelos*) and eight amber-listed species (Green Woodpecker *Picus viridis*, Stock Dove *Columba oenas*, Mistle Thrush *Turdus viscivorus*, Whitethroat *Sylvia communis*, Willow Warbler *Phylloscopus trochilus*, Dun-

nock *Prunella modularis*, Bullfinch *Pyrrhula pyrrhula* and Reed Bunting *Emberiza schoeniclus*) of conservation concern (Eaton *et al.* 2009).

Compared with the 1910 Burrell and Clarke description of the birds of Flordon Common, there are some notable differences (Table 1). In 1910, the Reed Bunting was described as the most common bird of the Common, compared with one pair in 2010. The Common was likely to have been far wetter in 1910 compared with 2010, but in addition we know that this species has undergone extensive population declines at least during the past thirty years that national bird monitoring schemes have existed (Baillie *et al.* 2006, <http://www.bto.org/birdtrends>). Other species recorded as breeding in 1910 which are now absent as breeding species on the Common include Grey Partridge *Perdix perdix*, Lapwing *Vanellus vanellus*, Snipe *Gallinago gallinago*, Coot *Fulica atra* and Meadow Pipit *Anthus pratensis*. Whilst the point at which these species ceased to breed on Flordon Common is not known, all species were still breeding there in 1922 (Clarke 1922), although by the 1970s, only Snipe remained as a breeding species. A photograph of a Snipe's nest was taken by Ted Ellis on the Common in 1974 and there are records of drumming Snipe through the mid to late 1980s (M Nash and S Paston pers. comm.). It is believed that Snipe had stopped nesting on the Common by about 1990 (M Nash pers. comm.). In contrast to these declines, there has been an apparent increase in the number of Common Buzzards *Buteo buteo* recorded over the Common during the past few years (2008 to 2010) in line with wider increases within the county (Norfolk Bird &

Table 1. The current and past (1910) status of birds of Flordon Common. [Rare = < 10 records a year, Scarce = 10 to 20 records a year.]

Species	Presence 2009/2010	Status 1910	Minimum no. breeding ter- ritories/pairs		Individuals (all ages)	
			2009	2010	Ringed	Re- trapped
Mallard <i>Anas platyrhynchos</i>	All year	All year	0	1	8	3
Pheasant <i>Phasianus colchicus</i>	All year	Breeding	8	7	0	0
Little Egret <i>Egretta garzetta</i>	Winter		-	-	0	0
Grey Partridge <i>Perdix perdix</i>	Absent	Breeding	-	-	-	-
Grey Heron <i>Ardea cinerea</i>	All year/scarce	Non-breeding	0	0	0	0
Common Buzzard <i>Buteo buteo</i>	All year/scarce		0	0	0	0
Sparrowhawk <i>Accipiter nisus</i>	All year		0	1	5	2
Kestrel <i>Falco tinnunculus</i>	All year		0	0	1	0
Hobby <i>Falco subbuteo</i>	Autumn/rare		0	0	0	0
Water Rail <i>Rallus aquaticus</i>	Winter/rare		-	-	0	0
Moorhen <i>Gallinula chloropus</i>	All year	Breeding	3	2	12	5
Coot <i>Fulica atra</i>	Absent	Breeding	-	-	-	-
Lapwing <i>Vanellus vanellus</i>	Absent	Breeding	-	-	-	-
Woodcock <i>Scolopax rusticola</i>	Winter	Non-breeding	-	-	0	0
Snipe <i>Gallinago gallinago</i>	Winter/scarce	Breeding	-	-	0	0
Jack Snipe <i>Lymnocyptes minimus</i>	Absent	Winter / rare	-	-	-	-
Stock Dove <i>Columba oenas</i>	All year		2	1	6	0
Woodpigeon <i>Columba palumbus</i>	All year		16	12	3	1
Collared Dove <i>Streptopelia decaocto</i>	All year/scarce		0	0	0	0
Turtle Dove <i>Streptopelia turtur</i>	Summer/scarce		1	0	0	0
Cuckoo <i>Cuculus canorus</i>	Summer		2	2	0	0
Tawny Owl <i>Strix aluco</i>	All year		1	1	0	0
Barn Owl <i>Tyto alba</i>	All year		0	0	0	0
Little Owl <i>Athene noctua</i>	All year		0	1	0	0
Swift <i>Apus apus</i>	Summer		0	0	0	0
Kingfisher <i>Alcedo atthis</i>	All year/scarce	Breeding	0	0	1	0
Green Woodpecker <i>Picus viridis</i>	All year		2	2	1	0
Great Spotted Woodpecker <i>Dendocopos major</i>	All year		2	2	10	12
Sand Martin <i>Riparia riparia</i>	Summer	Breeding	0	0	0	0
Barn Swallow <i>Hirundo rustica</i>	Summer		0	0	0	0
House Martin <i>Delichon urbicum</i>	Summer		0	0	0	0
Meadow Pipit <i>Anthus pratensis</i>	Absent	Breeding	-	-	-	-
Pied Wagtail <i>Motacilla alba</i>	All year		0	0	2	0
Dunnock <i>Prunella modularis</i>	All year	Breeding	4	2	135	373
Robin <i>Erithacus rubecula</i>	All year	Breeding	9	6	87	147
Song Thrush <i>Turdus philomelos</i>	All year	Breeding	4	4	23	9
Redwing <i>Turdus iliacus</i>	Winter		-	-	34	0
Mistle Thrush <i>Turdus viscivorus</i>	All year/scarce	Breeding	1	0	0	0
Fieldfare <i>Turdus pilaris</i>	Winter		-	-	14	0
Blackbird <i>Turdus merula</i>	All year	Breeding	9	5	226	192
Garden warbler <i>Sylvia borin</i>	Spring/autumn		1	0	2	0
Blackcap <i>Sylvia atricapilla</i>	Summer		4	6	123	8
Whitethroat <i>Sylvia communis</i>	Summer		3	2	15	2

Species	Presence 2009/2010	Status 1910	Minimum no. breeding ter- ritories/pairs		Individuals (all ages)	
			2009	2010	Ringed	Re- trapped
Lesser Whitethroat <i>Sylvia curruca</i>	Autumn	Breeding	0	0	3	0
Cetti's Warbler <i>Cettia cetti</i>	Spring /rare ¹		0	0	0	0
Reed Warbler <i>Acrocephalus scirpaceus</i>	Autumn /rare ²		0	0	2	0
Willow Warbler <i>Phylloscopus tro- chilus</i>	Summer/scarce	Breeding	1	0	4	0
Chiffchaff <i>Phylloscopus collybita</i>	Summer		5	7	42	4
Goldcrest <i>Regulus regulus</i>	All year		0	3	22	6
Wren <i>Troglodytes troglodytes</i>	All year	Breeding	14	12	24	8
Great Tit <i>Parus major</i>	All year		6	8	324	449
Coal Tit <i>Periparus ater</i>	All year		1	1	24	21
Blue Tit <i>Cyanistes caeruleus</i>	All year		7	10	311	543
Marsh Tit <i>Poecile palustris</i>	All year		2	2	20	47
Long-tailed Tit <i>Aegithalos caudatus</i>	All year	Breeding	4	2	94	192
Treecreeper <i>Certhia familiaris</i>	All year		2	1	11	7
Magpie <i>Pica pica</i>	All year		2	1	2	0
Jay <i>Garrulus glandarius</i>	All year		1	1	3	2
Jackdaw <i>Corvus monedula</i>	All year		3	2	0	0
Carrion Crow <i>Corvus corone</i>	All year/scarce		1	0	0	0
Starling <i>Sturnus vulgaris</i>	Winter		-	-	1	0
House Sparrow <i>Passer domesticus</i>	All year/scarce		1	0	0	0
Chaffinch <i>Fringilla coelebs</i>	All year	Breeding	9	9	496	174
Brambling <i>Fringilla montifringilla</i>	Winter		-	-	3	0
Linnet <i>Carduelis cannabina</i>	All year/rare	Breeding	1	0	0	0
Lesser Redpoll <i>Carduelis cabaret</i>	Winter		-	-	3	1
Goldfinch <i>Carduelis carduelis</i>	All year	Breeding	2	1	668	365
Greenfinch <i>Chloris chloris</i>	All year		6	2	1091	189
Siskin <i>Carduelis spiuus</i>	Winter		-	-	193	151
Bullfinch <i>Pyrrhula pyrrhula</i>	Spring/autumn		1	1	40	26
Reed Bunting <i>Emberiza schoeniclus</i>	All year/scarce	Breeding	0	1	0	0
TOTAL			140	121	4089	2939

¹ Male holding territory in 2006

² Two individuals, presumably migrants ringed in September 2010

Mammal Report 2008). A Little Egret *Egretta garzetta* also spent the first few months of 2010 in ditches on and around the Common, a species which would have been an extreme rarity in Norfolk in 1910 at the time of Burrell and Clarke.

Bird ringing

Much of what is known about the birds of Flordon Common has been gained by watching and counting birds on the Com-

mon, but our understanding of the seasonal use of the Common has improved further through bird ringing¹ by SN. Mist nets, fine nets erected between poles and designed to catch birds in flight, were most commonly

¹ Bird ringing in the UK is carried out under British Trust for Ornithology (BTO) licence. A lightweight uniquely numbered metal ring is placed around a bird's leg and provides a reliable and harmless method for identifying birds as individuals. The BTO relies on people reporting birds, so if you find a ringed bird please visit <http://www.ring.ac>.

used. Mist-netting largely took place just outside the boundary of the Common in the garden at Stone House, next to the Norwich road entrance to Flordon Common and on land bordering Flordon Common owned by Redwings Horse Sanctuary, with ringing carried out on one occasion on the Common itself at east spring drain.

Between 28 October 2007 and 10 September 2010, 407 mist-netting sessions were carried out. The majority of these took place between 06:00 and 08:30 hours and lasted an average of 2.5 hours. In addition, Potter traps, cage traps with a trip wire which closes a door, were used on a number of dates specifically to target moorhens *Gallinula gallinula* and wintering Blackbirds *Turdus merula*. During this period approximately 4,100 birds were ringed, with about 2,900 subsequent recaptures. The number of individuals of each species ringed and recaptured during this time are summarised in Table 1. The longer-term aim is that continued ringing will allow us to start to look at annual variation in the number of young that leave the nest and how many adults survive the stresses of breeding, migration and severe weather. In the short-term we are already improving our understanding of the local and larger-scale movements of birds that use Flordon Common and the close surrounding area. Figure 1 summarises the local movements (between 1 and 25-km) and Figure 2 the larger scale movements (>25km) of birds ringed or recaptured on Flordon Common and neighbouring land between October 2007 and June 2010.

Acknowledgements

We are particularly grateful to Lynn Cutress and Helen Whitelegg from Redwings Horse Sanctuary for very kindly giving us permission to ring on their land. Many thanks are also due to Peter Aspinall, Margaret Nash and Stuart Paston for providing records, and to Peter Aspinall and Janet Negal for commenting on and improving an earlier draft of this chapter.

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SE Newson Stone House, Norwich Road,
Hapton, Norwich, NR15 1RZ

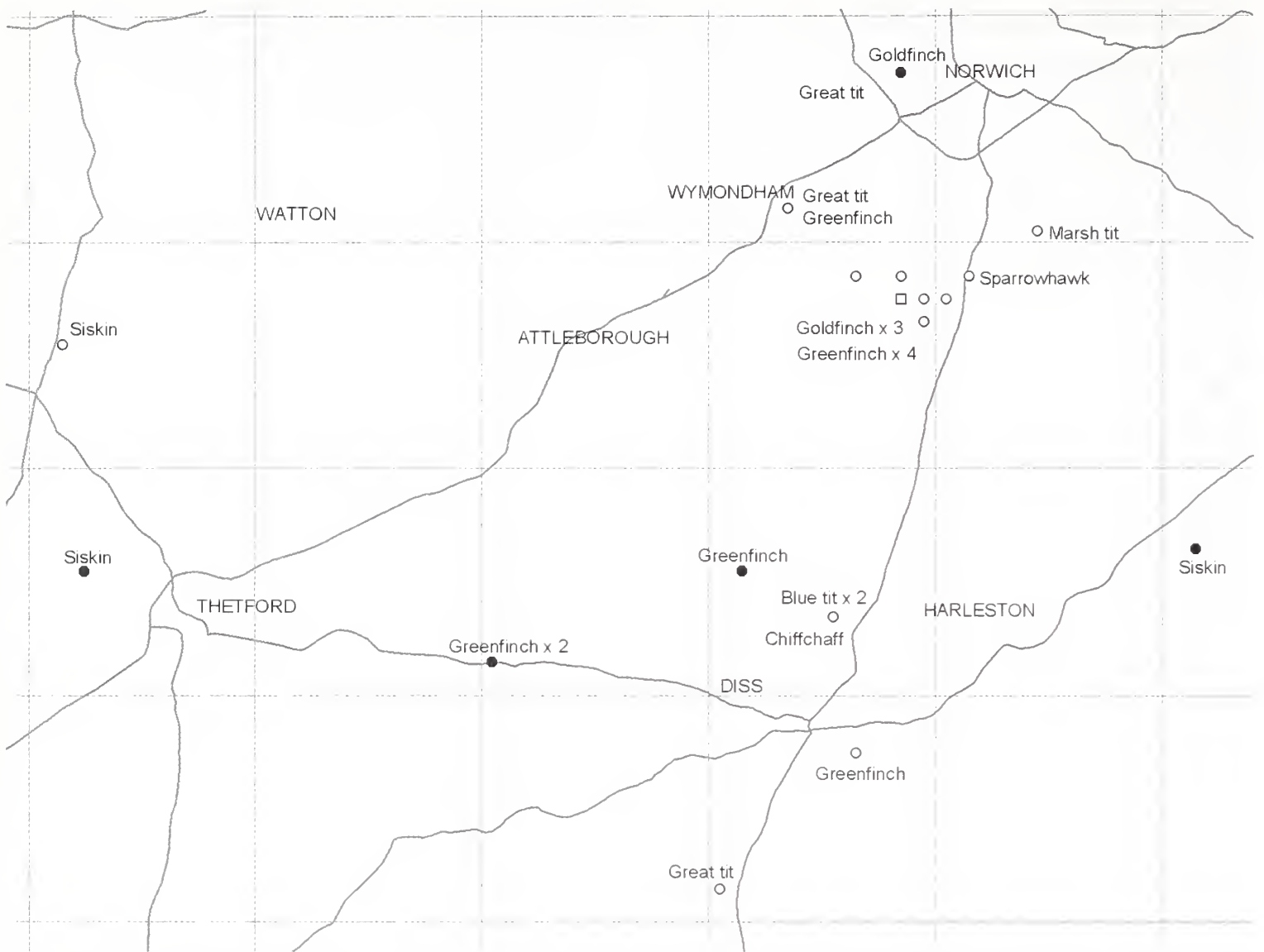


Figure 1. Local movements (between 1 and 25 km) of birds ringed on Flordon Common or adjacent land (o) or recaptured here but originally ringed elsewhere (●) between October 2007 and June 2010. Flordon Common is shown as an open square (□). Primary roads and 10 km grid shown for scale.



Figure 2. Large-scale (>25 km) movements of birds ringed on Flordon Common or adjacent land (o) or recaptured here but originally ringed elsewhere (●) between October 2007 and June 2010.

Amphibia and reptiles

Peter Aspinall

Since May 2009, the author has made daily records of any species of amphibian or reptile seen on Flordon Common (excluding four days of holiday in September 2009).

Common Frogs *Rana temporaria* and Common Toads *Bufo bufo* were regularly seen anywhere on the common during the spring and summer months, whilst Smooth Newts *Triturus vulgaris* can easily be observed at this time of year in the larger pools. Of the

reptiles, Common Lizards *Lacerta vivipara* appear to be fairly localised on the common and most commonly associated with dead wood whilst Slow-worms *Anguis fragilis* and Grass Snakes *Natrix natrix* were seen on one or two occasions each month between May and September.

P Aspinall Harvey House, Norwich Road, Flordon, Norwich, NR15 1RX

Species list

Species	Presence 2009/2010	Status 1910
Amphibia		
Common Frog <i>Rana temporaria</i>	Common	Common
Common Toad <i>Bufo bufo</i>	Common	Common
Smooth Newt <i>Triturus vulgaris</i>	Common	Common
Reptiles		
Common Lizard <i>Lacerta vivipara</i>	Common at low density	Common ?
Grass Snake <i>Natrix natrix</i>	Common at low density	Not recorded
Slow-worm <i>Anguis fragilis</i>	Common at low density	Not recorded

ERRATA *Trans. Norfolk Norwich Nat. Soc. 2010 43(1) p.62*

Captions should read:

Figure 1. Local movements (between 1 and 25 km) of birds ringed on Flordon Common or adjacent land (o) or recaptured here but originally ringed elsewhere (●) between October 2007 and June 2010. Flordon Common is shown as an open square (□). Primary roads and 10 km grid shown for scale.

Flordon Common

Orthoptera

David Richmond

Dark Bush-cricket *Pholidoptera griseoptera* and Speckled Bush-cricket *Leptophyes punctatissima* are long-established residents in the scrubby areas of the Common; but Roesel's Bush-cricket and the two species of conehead are more recent colonisers. Roesel's Bush-cricket *Metriopectera roeselii* was first recorded in Norfolk in 1997, but was not recorded at Flordon until 2007 when the first individuals were heard in the rough grass of the Western Common. It was first heard in the main common area in 2009.

The two conehead species are also expanding their range in Norfolk. Short-winged Conehead *Conocephalus dorsalis* is a long-established Norfolk species traditionally associated with coastal saltmarsh and dunes, and the Broads area, but also occurring inland on wet commons and in dry Breck grassland. In more recent years it has been expanding its range across much of the county, though it was not recorded at Flordon until 2007, earlier searches with a bat detector having failed to find it. It is now abundant in the rank vegetation of the main part of the common, though it has not yet been heard in the Western Common, or in the marshy vegetation at the eastern end of the Common.

These two areas have, however, been colonised by Long-winged Conehead *Conocephalus discolor*. This is a more recent arrival in Norfolk having been first recorded in the year 2000 and subsequently having spread across the whole of the county. It was first recorded at Flordon in 2007 (west) and 2009 (east).

Only three grasshopper species have been recorded by the author at Flordon: Common

Green Grasshopper *Omocestus viridulus*, Meadow Grasshopper *Omocestus viridulus* and Lesser Marsh Grasshopper *Chorthippus albomarginatus*. All occupy areas of lush grass. Slender Groundhopper *Tetrix subulata* has been found in areas of wet mud and is best searched for in spring.

Common Earwig *Forficula auricularia* has been beaten from Sycamore and Hazel at the margins of the site.

DI Richmond 42 Richmond Rise, Reepham, Norwich, NR10 4LS

Species list

Orthoptera

Dark Bush-cricket	<i>Pholidoptera griseoptera</i>
Roesel's Bush-cricket	<i>Metriopectera roeselii</i>
Long-winged Cone-head	<i>Conocephalus discolor</i>
Short-winged Cone-head	<i>Conocephalus dorsalis</i>
Speckled Bush-cricket	<i>Leptophyes punctatissima</i>
Slender Groundhopper	<i>Tetrix subulata</i>
Common Green Grasshopper	<i>Omocestus viridulus</i>
Meadow Grasshopper	<i>Chorthippus parallelus</i>
Lesser Marsh Grasshopper	<i>Chorthippus albomarginatus</i>

Dermaptera

Common Earwig	<i>Forficula auricularia</i>
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Nomenclature follows *Grasshoppers and Allied Insects of Great Britain and Ireland* (1988) by JA Marshall & ECM Haes, Harley Books.

Bees, wasps and ants (aculeate hymenoptera)

David Richmond, Tim Strudwick & Doreen Wells

Bumblebees David Richmond

The flower-rich fen and tangled bramble along the north-east boundary of the site provide abundant foraging opportunities for the bumblebee fauna. All six of the common British species have been recorded here: *Bombus hortorum*, *lapidarius*, *lucorum*, *pascuorum*, *pratorum* and *terrestris*; together with the cuckoo bee *B. vestalis*.

In July 2010, Stuart Paston observed *B. hypnorum* beside the footpath on the south edge of the Common. This species was first recorded in Norfolk in 2008 and is currently being seen increasingly often across the county.

Also in July 2010, Tim Strudwick reported a queen *B. lucorum* of the type *cryptarum*. Many continental authors regard this form as a distinct species but there is as yet no consensus among British authors as to its taxonomic status.

Species list

Apidae

<i>Bombus lucorum</i>	White-tailed Bumblebee
<i>Bombus lucorum s. cryptarum</i>	
<i>Bombus terrestris</i>	Buff-tailed Bumblebee
<i>Bombus pratorum</i>	Early-nesting Bumblebee
<i>Bombus hypnorum</i>	Tree Bumblebee
<i>Bombus hortorum</i>	Garden Bumblebee
<i>Bombus lapidarius</i>	Red-tailed Bumblebee
<i>Bombus pascuorum</i>	Common Carder Bee
<i>Bombus vestalis</i>	Cuckoo of <i>B. terrestris</i>

Solitary bees Tim Strudwick

While bumblebees are conspicuous and active for many months of the year, most solitary bees are small, inconspicuous and have short flight periods. Many are found at

low densities, and range widely to find nest sites, nectar and pollen. Thus, they require some effort to survey, and it could take ten or more visits spread between April and September to get close to recording all the species using a site. For this survey, just three survey visits, were made to the site, on 19/06/2009, 24/04/2010 and 24/07/2010, using a combination of water traps and spot netting. The resulting species list of 37 species is doubtlessly incomplete, though gives a good indication of the solitary bee community present.

Mining bees were well represented at Flordon, with nine *Andrena* and twelve *Lasioglossum* species, together with several of their *Nomada* and *Sphecodes* kleptoparasites. Many of these are common species but four deserve some comment. *Andrena praecox* is widespread in the UK but infrequently recorded, possibly due to its early flight period (Mar-Apr). Several females were found on the small clump of willows, the species' sole pollen source, at the east of the site. *Lasioglossum cupromicans* is a tiny, metallic blue-green bee, widespread in northern Britain but very scarce in southern England. It has no strong habitat associations and is only known from two other Norfolk sites. *Lasioglossum fulvicorne* is a widespread species of calcareous grassland, locally abundant in West Norfolk, but not recorded before in vice-county (VC) 27. *Lasioglossum quadrinotatum* is a Nationally Scarce species of sandy grassland, with about a dozen previous records in VC28, but not recorded previously from VC27. There have since been two other records from East Norfolk and this species may be increasing in the county. *L. pauxillum* and *L. malachurum* have increased recently and

no longer deserve their Nationally Scarce status.

Not all species recorded were ground nesting species. *Megachile ligniseca*, the largest of the eight British leafcutter bees, nests in deadwood. The common Red Mason Bee *Osmia rufa*, will nest in deadwood or soil banks but is more typically found nesting in walls, as it was here at Harvey House.

'White-faced bees' of the genus *Hylaeus* are small, almost hairless and nest in the ground, deadwood or hollow stems. Males usually have extensive white face markings while females have a pair of spots. Of the five species recorded, *Hylaeus signatus* is the largest. A few males were found buzzing around some Weld *Reseda luteola* on the northern boundary of the Common. This Nationally Scarce bee collects pollen solely from *Reseda* spp. and is fairly frequent in East Norfolk.

Wet habitats are generally not rich in solitary bees. Nevertheless, the variety and abundance of pollen and nectar sources in the botanically rich fen and damp grassland vegetation and the drier margins of the site helped support a diverse assemblage, including four Nationally Scarce species. Sallow, hawthorn, brambles, thistles and hemp agrimony were particularly important pollen and nectar resources. However, the feature that was possibly most important in supporting the assemblage of species recorded was the dry, sandy grassland at the fringes of the site.

Species list

Apidae

Andrena bicolor Fabricius
Andrena carantonica Perez
Andrena dorsata Kirby
Andrena flavipes Panzer
Andrena haemorrhoa Fabricius
Andrena minutula Kirby
Andrena nigroaenea Kirby
Andrena praecox Scopoli
Andrena subopaca Nylander
Anthophora plumipes Pallas

Halictus rubicundus Christ
Halictus tumulorum Linnaeus
Hylaeus annularis Kirby
Hylaeus brevicornis Nylander
Hylaeus communis Nylander
Hylaeus hyalinatus Smith
Hylaeus signatus Panzer
Lasioglossum albipes Fabricius
Lasioglossum calceatum Scopoli
Lasioglossum cupromicans Perez
Lasioglossum fulvicorne Kirby
Lasioglossum leucopus Kirby
Lasioglossum malachurum Kirby
Lasioglossum minutissimum Kirby
Lasioglossum morio Fabricius
Lasioglossum parvulum Schenck
Lasioglossum pauxillum Schenck
Lasioglossum quadrinotatum Kirby
Lasioglossum villosulum Kirby
Megachile ligniseca Kirby
Melecta albifrons Forster
Nomada fabriciana Linnaeus
Nomada flavoguttata Kirby
Nomada goodeniana Kirby
Osmia rufa Linnaeus
Sphecodes ephippius Linnaeus
Sphecodes mouilicornis Kirby

Aculeate Wasps *Tim Strudwick*

The comments above in relation to the effort required to survey solitary bees equally applies to solitary wasps, and the 23 species recorded must only represent a sample of those present. As with the bees, most wasp species recorded at Flordon Common were ground-nesting. Among the digger-wasps were three of the five UK species of *Cerceris*, including the Red Data Book (RDB) 3 and Biodiversity Action Plan (BAP) Priority species *Cerceris quinquefasciata*. This small black and yellow wasp hunts various species of weevils. It was observed taking nectar on creeping thistle at the north-west of the site, and may have been nesting on the adjacent footpath alongside *Cerceris rybyensis*. It is a rare species, but may be expanding its distribution after a decline in the 1970s and 1980s. Its Norfolk distribution

was until recently believed to be restricted to the Brecks, but in 2010 it was found at two sites near Norwich as well as Flordon.

Other digger wasps included *Argogorytes mystaceus*, *Gorytes quadrifasciatus*, *Nysson trimaculatus*, *Mellinus arvensis* and the tiny *Diodontus tristis*. The Nationally Scarce *G. quadrifasciatus* hunts froghoppers to provision its nest, and is locally frequent in sandy parts of Norfolk. Though associated with dry sandy ground it is often found foraging in damp habitats. It is most often observed on hogweed, as it was at Flordon, or *Angelica silvestris* flowers. *Nysson trimaculatus*, also a Nationally Scarce species, is a kleptoparasite on *Gorytes quadrifasciatus* and other related species, and is widespread in Norfolk.

The three species of *Priocnemis* and *Anoplius* are spider-hunting wasps. *Priocnemis coriacea* is a Nationally Scarce species, and is found on drier soils but otherwise has no clear habitat associations. There are less than ten Norfolk records but it is a tricky species to identify so is possibly very under-recorded.

The digger wasps of the genera *Crossocerus*, *Ectemnius*, *Mimumesa* and *Pemphredon*, and the mason wasp *Symmorphus gracilis* nest, in deadwood or hollow stems. *S. gracilis* nests in beetle holes and is associated with damp habitats, often hunting the larvae of the weevil *Cionus hortulanus* on figworts *Scrophularia* spp.

The four species of social wasp recorded are all common species. *Dolichovespula media* is a relative newcomer to the UK and still expanding, its Nationally Scarce status reflecting the situation 20 years ago and no longer deserved.

The botanical and structural diversity of the vegetation provided a range of prey species for the solitary wasps, but as for the solitary bees, the most interesting species were associated with the dry sandy habitat. 84% of the solitary bee and wasp species re-

corded, including the one RDB3 and seven Nationally Scarce species, were ground-nesters, and many of these were observed nesting in dry ground along the northern fringe of the site.

Small patches of uncultivated habitat with diverse vegetation like Flordon Common are essential for the survival of a diverse community of bees and wasps in the modern agricultural landscape.

Species list

Chrysididae - ruby-tailed wasps

Chrysis ignita Linnaeus s.l.

Pompilidae - spider-hunting wasps

Anoplius nigerrimus Scopoli

Priocnemis parvula Dahlbom

Priocnemis perturbator Harris

Priocnemis coriacea Dahlbom

Vespididae - social and mason wasps

Dolichovespula media Retzius

Dolichovespula sylvestris Scopoli

Symmorphus gracilis Brulle

Vespula germanica Fabricius

Vespula vulgaris Linnaeus

Sphecidae - digger wasps

Argogorytes mystacens Linnaeus

Cerceris arenaria Linnaeus

Cerceris quinquefasciata Rossi

Cerceris rybyensis Linnaeus

Crossocernis cetratus Shuckard

Crossocernis podagricus Vander Linden

Diodontus tristis Vander Linden

Ectemnius continuus Fabricius

Ectemnius lapidarius Panzer

Gorytes quadrifasciatus Fabricius

Mellinus arvensis Linnaeus

Mimumesa dahlbomi Wesmael

Nysson trimaculatus Rossi

Oxybelus nigrilunus Linnaeus

Pemphredon inornata Say

Trypoxylon attenuatum Smith

Trypoxylon medianum de Beaumont

Ants Doreen Wells

The mixed habitats at Flordon provided the opportunity to record species from five

very different environments: fen, calcareous grassland, carr woodland, shady hedgerow with mature Ash *Fraxinus excelsior* tree and the garden at Harvey House; only the carr woodland was unproductive for ant species. Six species of ant were recorded at Flordon Common SSSI and the Western Common on the 2nd May 2009. A further visit on the 19th June 2009 did not add species, although the same species were again recorded at different locations.

The most important find on this site was that of *Temnothorax nylanderii* (see photo p. 23), a species for which there are very few Norfolk records. Flordon Common is believed to be the most northerly location so far recorded for this species in Norfolk. *Temnothorax nylanderii* is a very small unobtrusive ant (workers approx. 2.2 mm) from the subfamily Myrmicinae, an arboreal species which favours trees in shady sheltered positions, often in parkland or open woodland. Three separate nests of this species were found on, and beneath, the mature Ash tree in a shady situation on the edge of the Western Common. The first inside stems of a severed ivy entwined around the trunk and the other two nests in separate branches of dead Ash in the undergrowth.

All the other ant species recorded are fairly common in their respective habitats on both areas of Flordon Common:

Formica fusca nests in the roots of shrubs on edge of wooded area

Lasius flavus ant-hill nests in the dry grassland

Lasius niger nests in grassland and is widespread in the garden at Harvey House

Myrmica rubra nests in moist earth with vegetation under Ash tree on the Western Common

Myrmica scabrinodis nests in the wet fen in the SSSI and wet and dry grassland on both sites.

For such a small site, the diversity and

quality of habitats provided good nesting sites for these species.

Species list

Formicidae

Formica fusca Linnaeus

Lasius flavus Fabricius

Lasius niger s.s. Linnaeus

Myrmica rubra Linnaeus

Myrmica scabrinodis Nylander

Temnothorax nylanderii Foerster

DI Richmond 42 Richmond Rise, Reepham, Norwich NR10 4LS

T Strudwick 16 Beech Way, Brundall, Norwich NR13 5ND

DEH Wells 1 Cobden Terrace, Northgate Street, Great Yarmouth NR30 1BT

Moths and butterflies

Lucy Snow & Stuart Newson

In the original 1910 Burrell & Clarke publication on the fauna and flora of Flordon Common, no mention is made of moths or butterflies present at that time. This study presents a modern record of the moths and butterflies of Flordon common from work carried out between 2003 – 2010.

Methods

A total of 50 nights of moth trapping were carried out between 26 July 2008 and 15 July 2010 in a private garden adjacent to the common with an accessible power source. A further 17 nights were spent on the common itself between 13 June 2009 and 10 July 2010. In addition, further records from three visits to the common on 31 May 2003, 27 September 2003 and 14 August 2004 by Mike Hall in conjunction with Norfolk and Norwich Naturalists' Society (Hall 2003) were added to the common list.

All moth trapping was carried out using a 125 watt mercury vapour (MV) bulb and Skinner trap, and in most cases traps were left on overnight and checked the following morning. It is important to note that there is a bias in moth recording towards night flying moths that are attracted to light. Only a single survey was carried out in daylight and no lures or bait were used. The complexity of identifying micro moths meant that only a few species were identified after the 2003/04 surveys. During the 2003/4 visits to the common, some time was also spent surveying the site for moths in the daylight.

The butterfly records represent observations by the authors and others who visit the common regularly; no formal trapping or survey of butterflies was carried out.

Moths

A total of 378 moth species was recorded on or adjacent to Flordon Common over the sampling period (Table 1). The majority of these species are widespread and common with a few rated as noteworthy due to localised occurrence. Notable species include Cream-bordered Green Pea *Earias clorana*, Grey Carpet *Lithostege grisata*, Marsh Pug *Eupithecia pygmaeata* and the tortrix *Phalonia manniiana*. See www.norfolkmoths.co.uk for more information on moth species distribution and status in Norfolk.

Butterflies

The survey recorded 20 different butterfly species (Table 2). These species are all widespread throughout England and only the Small Tortoiseshell *Aglais urticae* is of some conservation interest due to recent population decline (see www.butterfly-conservation.org).

Acknowledgements

The authors wish to thank Peter Aspinall, Janet Negal, Stuart Paston and Mike Hall for contributing records.

References

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SE Newson Stone House, Norwich Road, Hapton, Norwich, NR15 1RZ

L Snow Stone House, Norwich Road, Hapton, Norwich, NR15 1RZ

Table 1 Species list: moths. Status from www.norfolk-moths.co.uk

Scientific name	English name	National status
MACROLEPIDOPTERA		
Arctiidae		
<i>Thumatha senex</i>	Round-winged Muslin	Resident Local
<i>Miltochrista miniata</i>	Rosy Footman	Resident Local
<i>Cybosia mesomella</i>	Four-dotted Footman	Resident Local
<i>Eilema sororcula</i>	Orange Footman	Resident Local
<i>Eilema griseola</i>	Dingy Footman	Resident Common
<i>Eilema complana</i>	Scarce Footman	Resident Local
<i>Eilema depressa</i>	Buff Footman	Resident Local
<i>Eilema lurideola</i>	Common Footman	Resident Common
<i>Spilosoma lubricipeda</i>	White Ermine	Resident Common
<i>Spilosoma luteum</i>	Buff Ermine	Resident Common
<i>Diaphora mendica</i>	Muslin Moth	Resident Common
<i>Phragmatobia fuliginosa</i>	Ruby Tiger	Resident Common
<i>Tyria jacobaeae</i>	Cinnabar	Resident Common
Cossidae		
<i>Zeuzera pyrina</i>	Leopard Moth	Resident Common
Drepanidae		
<i>Watsonalla biuaria</i>	Oak Hook-tip	Resident Common
<i>Drepana falcataria</i>	Pebble Hook-tip	Resident Common
<i>Cilix glaucata</i>	Chinese Character	Resident Common
<i>Thyatira batis</i>	Peach Blossom	Resident Common
<i>Habrosyne pyritoides</i>	Buff Arches	Resident Common
<i>Tethea ocularis</i>	Figure of Eighty	Resident Common
<i>Polyploca rideus</i>	Frosted Green	Resident Local
Geometridae		
<i>Abraxas grossulariata</i>	Magpie Moth	Resident Common
<i>Lomaspilis marginata</i>	Clouded Border	Resident Common
<i>Ligdia adustata</i>	Scorched Carpet	Resident Local
<i>Macaria liturata</i>	Tawny-barred Angle	Resident Common
<i>Chiasmia clathrata</i>	Latticed Heath	Resident Common
<i>Plagodis dolabraria</i>	Scorched Wing	Resident Local
<i>Opisthograptis luteolata</i>	Brimstone Moth	Resident Common
<i>Epione repandaria</i>	Bordered Beauty	Resident Common
<i>Apeira syringaria</i>	Lilac Beauty	Resident Local
<i>Ennomos alniaria</i>	Canary-shouldered Thorn	Resident Common
<i>Ennomos fuscantaria</i>	Dusky Thorn	Resident Common
<i>Selenia dentaria</i>	Early Thorn	Resident Common
<i>Selenia tetralunaria</i>	Purple Thorn	Resident Common
<i>Crocallis elinguarua</i>	Scalloped Oak	Resident Common
<i>Ourapteryx sambucaria</i>	Swallow-tailed Moth	Resident Common
<i>Colotois pennaria</i>	Feathered Thorn	Resident Common
<i>Phigalia pilosaria</i>	Pale Brindled Beauty	Resident Common
<i>Lycia hirtaria</i>	Brindled Beauty	Resident Common
<i>Biston strataria</i>	Oak Beauty	Resident Common
<i>Biston betularia</i>	Peppered Moth	Resident Common

Scientific name	English name	National status
<i>Agriopsis marginaria</i>	Dotted Border	Resident Common
<i>Peribatodes rhomboidaria</i>	Willow Beauty	Resident Common
<i>Alcis repandata</i>	Mottled Beauty	Resident Common
<i>Hypomecis puuctinalis</i>	Pale Oak Beauty	Resident Common
<i>Ectropis bistortata</i>	Engrailed	Resident Common
<i>Cabera pusaria</i>	Common White Wave	Resident Common
<i>Cabera exanthemata</i>	Common Wave	Resident Common
<i>Lomographa temerata</i>	Clouded Silver	Resident Common
<i>Theria primaria</i>	Early Moth	Resident Common
<i>Campaea margaritata</i>	Light Emerald	Resident Common
<i>Geometra papilionaria</i>	Large Emerald	Resident Common
<i>Hemithea aestivaria</i>	Common Emerald	Resident Common
<i>Jodis lactearia</i>	Little Emerald	Resident Common
<i>Xanthorhoe designata</i>	Flame Carpet	Resident Common
<i>Xanthorhoe spadicearia</i>	Red Twin-spot Carpet	Resident Common
<i>Xanthorhoe ferrugata</i>	Dark-barred Twin-spot Carpet	Resident Common
<i>Xanthorhoe quadrifasiata</i>	Large Twin-spot Carpet	Resident Local
<i>Xanthorhoe montanata</i>	Silver-ground Carpet	Resident Common
<i>Xanthorhoe fluctuata</i>	Garden Carpet	Resident Common
<i>Scotopteryx chenopodiata</i>	Shaded Broad-bar	Resident Common
<i>Epirrhoe alternata</i>	Common Carpet	Resident Common
<i>Epirrhoe rivata</i>	Wood Carpet	Resident Local
<i>Campptogramma bilineata</i>	Yellow Shell	Resident Common
<i>Anticlea badiata</i>	Shoulder Stripe	Resident Common
<i>Lampropteryx suffumata</i>	Water Carpet	Resident Common
<i>Cosmorhoe ocellata</i>	Purple Bar	Resident Common
<i>Eulithis inellinata</i>	Spinach	Resident Common
<i>Eulithis pyraliata</i>	Barred Straw	Resident Common
<i>Ecliptopera silaceata</i>	Small Phoenix	Resident Common
<i>Chloroclysta truncata</i>	Common Marbled Carpet	Resident Common
<i>Cidaria fulvata</i>	Barred Yellow	Resident Common
<i>Plemyria rubiginata</i>	Blue-bordered Carpet	Resident Common
<i>Colostygia pectinataria</i>	Green Carpet	Resident Common
<i>Hydriomena furcata</i>	July Highflyer	Resident Common
<i>Hydriomena impluviata</i>	May Highflyer	Resident Common
<i>Horisme vitalbata</i>	Small Waved Umber	Resident Common
<i>Rheumaptera undulata</i>	Scallop Shell	Resident Local
<i>Euphyia uuangulata</i>	Sharp-angled Carpet	Resident Local
<i>Epirrita dilutata</i>	November Moth	Resident Common
<i>Perizoma affinitata</i>	Rivulet	Resident Common
<i>Perizoma alchemillata</i>	Small Rivulet	Resident Common
<i>Perizoma flavofasciata</i>	Sandy Carpet	Resident Common
<i>Eupithecia exiguata</i>	Mottled Pug	Resident Common
<i>Eupithecia pygmaeata</i>	Marsh Pug	Nationally Scarce
<i>Eupithecia centaureata</i>	Lime-speck Pug	Resident Common
<i>Eupithecia assimilata</i>	Currant Pug	Resident Common
<i>Eupithecia vulgata</i>	Common Pug	Resident Common
<i>Eupithecia succenturiata</i>	Bordered Pug	Resident Common
<i>Chloroclystis v-ata</i>	V-Pug	Resident Common

Scientific name	English name	National status
<i>Pasiphila rectangulata</i>	Green Pug	Resident Common
<i>Lithostege griseata</i>	Grey Carpet	Red Data Book
<i>Euchoeca nebulata</i>	Dingy Shell	Resident Local
<i>Asthena albulata</i>	Small White Wave	Resident Common
<i>Hydrelia flammeolaria</i>	Small Yellow Wave	Resident Common
<i>Alsophila aescularia</i>	March Moth	Resident Common
<i>Cyclophora punctaria</i>	Maiden's Blush	Local
<i>Cyclophora linearia</i>	Clay Triple-lines	Local
<i>Timandra comae</i>	Blood-vein	Resident Common
<i>Scopula imitaria</i>	Small Blood-vein	Resident Common
<i>Scopula immutata</i>	Lesser Cream Wave	Resident Local
<i>Scopula floslactata</i>	Cream Wave	Resident Local
<i>Idaea biselata</i>	Small Fan-footed Wave	Resident Common
<i>Idaea fuscovenosa</i>	Dwarf Cream Wave	Resident Local
<i>Idaea seriata</i>	Small Dusty Wave	Resident Common
<i>Idaea dimidiata</i>	Single-dotted Wave	Resident Common
<i>Idaea trigeminata</i>	Treble Brown Spot	Resident Local
<i>Idaea emarginata</i>	Small Scallop	Resident Local
<i>Idaea aversata</i>	Riband Wave	Resident Common
<i>Rhodometra sacraria</i>	Vestal	Immigrant
Hepialidae		
<i>Hepialus humuli</i>	Ghost Moth	Resident Common
<i>Hepialus sylvina</i>	Orange Swift	Resident Common
<i>Hepialus hecta</i>	Gold Swift	Resident Local
<i>Hepialus lupulinus</i>	Common Swift	Resident Common
Lasiocampidae		
<i>Poecilocampa populi</i>	December Moth	Resident Common
<i>Malacosoma neustria</i>	Lackey	Resident Common
<i>Euthrix potatoria</i>	Drinker	Resident Common
Lymantriidae		
<i>Calliteara pudibunda</i>	Pale Tussock	Resident Common
<i>Euproctis chrysorrhoea</i>	Brown-tail	Resident Local
<i>Euproctis similis</i>	Yellow-tail	Resident Common
<i>Leucoma salicis</i>	White Satin	Resident Local
Noctuidae		
<i>Eupsilia transversa</i>	Satellite	Resident Common
<i>Conistra vaccinii</i>	Chestnut	Resident Common
<i>Agrochola macilenta</i>	Yellow-line Quaker	Resident Common
<i>Agrochola litura</i>	Brown-spot Pinion	Resident Common
<i>Agrochola lychnidis</i>	Beaded Chestnut	Resident Common
<i>Atethmia centrago</i>	Centre-barred Sallow	Resident Common
<i>Omphaloscelis lunosa</i>	Lunar Underwing	Resident Common
<i>Xanthia togata</i>	Pink-barred Sallow	Resident Common
<i>Xanthia icteritia</i>	Sallow	Resident Common
<i>Acronicta megacephala</i>	Poplar Grey	Resident Common
<i>Acronicta psi</i>	Grey Dagger	Resident Common
<i>Acronicta rumicis</i>	Knot Grass	Resident Common
<i>Simyra albovenosa</i>	Reed Dagger	Nationally Scarce

Scientific name	English name	National status
<i>Amphipyra pyramidea</i>	Copper Underwing	Resident Common
<i>Amphipyra berbera</i>	Svensson's Copper Underwing	Resident Common
<i>Amphipyra tragopoginis</i>	Mouse Moth	Resident Common
<i>Mormo maura</i>	Old Lady	Resident Local
<i>Dypterygia scabriuscula</i>	Bird's Wing	Resident Local
<i>Rusina ferruginea</i>	Brown Rustic	Resident Common
<i>Thalpophila matura</i>	Straw Underwing	Resident Common
<i>Euplexia lucipara</i>	Small Angle Shades	Resident Common
<i>Phlogophora meticulosa</i>	Angle Shades	Resident Common
<i>Parastichtis ypsillon</i>	Dingy Shears	Resident Local
<i>Cosmia trapezina</i>	Dun-bar	Resident Common
<i>Cosmia pyralina</i>	Lunar-spotted Pinion	Resident Local
<i>Apamea monoglypha</i>	Dark Arches	Resident Common
<i>Apamea lithoxylaea</i>	Light Arches	Resident Common
<i>Apamea crenata</i>	Clouded-bordered Brindle	Resident Common
<i>Apamea unanimitis</i>	Small Clouded Brindle	Resident Common
<i>Apamea anceps</i>	Large Nutmeg	Resident Local
<i>Apamea sordens</i>	Rustic Shoulder-knot	Resident Common
<i>Apamea scolopacina</i>	Slender Brindle	Resident Common
<i>Apamea opliogramma</i>	Double Lobed	Resident Common
<i>Oligia strigilis</i>	Marbled Minor	Resident Common
<i>Oligia latruncula</i>	Tawny Marbled Minor	Resident Common
<i>Oligia fasciuncula</i>	Middle-barred Minor	Resident Common
<i>Mesoligia furuncula</i>	Cloaked Minor	Resident Common
<i>Mesapamea secalis</i>	Common Rustic	Resident Common
<i>Photodes miuina</i>	Small Dotted Buff	Resident Common
<i>Chortodes pygmina</i>	Small Wainscot	Resident Common
<i>Eremobia ochroleuca</i>	Dusky Sallow	Resident Common
<i>Luperina testacea</i>	Flounced Rustic	Resident Common
<i>Amphipoea oculatea</i>	Ear Moth	Resident Common
<i>Hydraecia micacea</i>	Rosy Rustic	Resident Common
<i>Gortyna flavago</i>	Frosted Orange	Resident Common
<i>Nonagria typhae</i>	Bulrush Wainscot	Resident Common
<i>Archanara geminipuncta</i>	Twin-spotted Wainscot	Resident Local
<i>Rhizedra lutosella</i>	Large Wainscot	Resident Common
<i>Arenostola phragmitidis</i>	Fen Wainscot	Resident Local
<i>Coenobia rufa</i>	Small Rufous	Resident Local
<i>Charanyca trigrammica</i>	Treble Lines	Resident Common
<i>Hoplodrina alsines</i>	Uncertain	Resident Common
<i>Hoplodrina blanda</i>	Rustic	Resident Common
<i>Hoplodrina ambigua</i>	Vine's Rustic	Resident Common
<i>Caradrina morpheus</i>	Mottled Rustic	Resident Common
<i>Paradrina clavipalpis</i>	Pale Mottled Willow	Resident Common
<i>Chilodes maritimus</i>	Silky Wainscot	Resident Local
<i>Mesapamea didyma</i>	Lesser Common Rustic	Resident Common
<i>Cryphia domestica</i>	Marbled Beauty	Resident Common
<i>Catocala nupta</i>	Red Underwing	Resident Common
<i>Bena bicolorana</i>	Scarce Silver-lines	Resident Local
<i>Pseudoips prasiuana</i>	Green Silver-lines	Resident Common

Scientific name	English name	National status
<i>Shargacucullia verbasci</i>	Mullein	Resident Common
<i>Asteroscopus sphinx</i>	Sprawler	Resident Common
<i>Lithophane ornitopus</i>	Grey Shoulder-knot	Resident Common
<i>Xylocampa areola</i>	Early Grey	Resident Common
<i>Dichonia aprilina</i>	Merveille du Jour	Resident Common
<i>Blepharita adusta</i>	Dark Brocade	Resident Common
<i>Earias cloraua</i>	Cream-bordered Green Pea	Nationally Scarce
<i>Discestra trifolii</i>	Nutmeg	Resident Common
<i>Mamestra brassicae</i>	Cabbage Moth	Resident Common
<i>Melanchra persicariae</i>	Dot Moth	Resident Common
<i>Lacanobia oleracea</i>	Bright-line Brown-eye	Resident Common
<i>Melanchra pisi</i>	Broom Moth	Resident Common
<i>Hadena rivularis</i>	Campion	Resident Common
<i>Hadena perplexa</i>	Tawny Shears	Resident Common
<i>Hadena bicurris</i>	Lychnis	Resident Common
<i>Cerapteryx graminis</i>	Antler Moth	Resident Common
<i>Orthosia cruda</i>	Small Quaker	Resident Common
<i>Orthosia populeti</i>	Lead-coloured Drab	Resident Local
<i>Orthosia gracilis</i>	Powdered Quaker	Resident Common
<i>Orthosia cerasi</i>	Common Quaker	Resident Common
<i>Orthosia incerta</i>	Clouded Drab	Resident Common
<i>Orthosia munda</i>	Twin-spotted Quaker	Resident Common
<i>Orthosia gothica</i>	Hebrew Character	Resident Common
<i>Mythimna conigera</i>	Brown-line Bright Eye	Resident Common
<i>Mythimna ferrago</i>	Clay	Resident Common
<i>Mythimna albipuncta</i>	White-point	Nationally Scarce
<i>Mythimna pudorina</i>	Striped Wainscot	Resident Local
<i>Mythimna impura</i>	Smoky Wainscot	Resident Common
<i>Mythimna pallens</i>	Common Wainscot	Resident Common
<i>Mythimna comma</i>	Shoulder-striped Wainscot	Resident Common
<i>Mythimna flammea</i>	Flame Wainscot	Nationally Scarce
<i>Zanclognatha tarsipennalis</i>	Fan-foot	Resident Common
<i>Hypena proboscidalis</i>	Snout	Resident Common
<i>Hypena rostralis</i>	Buttoned Snout	Nationally Scarce
<i>Agrotis segetum</i>	Turnip Moth	Resident Common
<i>Agrotis clavis</i>	Heart and Club	Resident Common
<i>Agrotis exclamatiouis</i>	Heart and Dart	Resident Common
<i>Agrotis ipsilon</i>	Dark Sword-grass	Immigrant (Resident?)
<i>Agrotis puta</i>	Shuttle-shaped Dart	Resident Common
<i>Axylia putris</i>	Flame	Resident Common
<i>Ochropleura plecta</i>	Flame Shoulder	Resident Common
<i>Noctua pronuba</i>	Large Yellow Underwing	Resident Common
<i>Noctua comes</i>	Lesser Yellow Underwing	Resident Common
<i>Noctua fimbriata</i>	Broad-bordered Yellow Underwing	Resident Common
<i>Noctua janthe</i>	Lesser Broad-bordered Yellow Underwing	Resident Common
<i>Noctua interjecta</i>	Least Yellow Underwing	Resident Common
<i>Graphiphora augur</i>	Double Dart	Resident Common
<i>Diarsia mendica</i>	Ingrailed Clay	Resident Common
<i>Diarsia rubi</i>	Small Square-spot	Resident Common

Scientific name	English name	National status
<i>Xestia c-nigrum</i>	Setaceous Hebrew Character	Resident Common
<i>Xestia triangulum</i>	Double Square-spot	Resident Common
<i>Xestia sexstrigata</i>	Six-striped Rustic	Resident Common
<i>Xestia xanthographa</i>	Square-spot Rustic	Resident Common
<i>Anaplectoides prasina</i>	Green Arches	Resident Common
<i>Cerastis rubricosa</i>	Red Chestnut	Resident Common
<i>Lygephila pastinum</i>	Blackneck	Resident Local
<i>Colocasia coryli</i>	Nut-tree Tussock	Resident Common
<i>Diachrysia chrysitis</i>	Burnished Brass	Resident Common
<i>Plusia festucae</i>	Gold Spot	Resident Common
<i>Autographa gamma</i>	Silver Y	Immigrant
<i>Autographa pulchrina</i>	Beautiful Golden Y	Resident Common
<i>Autographa jota</i>	Plain Golden Y	Resident Common
<i>Abrostola triplasia</i>	Dark Spectacle	Resident Common
<i>Abrostola tripartita</i>	Spectacle	Resident Common
<i>Laspeyria flexula</i>	Beautiful Hook-tip	Resident Local
<i>Rivula sericealis</i>	Straw Dot	Resident Common
<i>Schrankia costaestrigalis</i>	Pinion-streaked Snout	Resident Local
Nolidae		
<i>Nola cucullatella</i>	Short-cloaked Moth	Resident Common
Notodontidae		
<i>Phalera bucephala</i>	Buff-tip	Resident Common
<i>Cernra vinula</i>	Puss Moth	Resident Common
<i>Furcula bicuspis</i>	Alder Kitten	Resident Local
<i>Furcula furcula</i>	Sallow Kitten	Resident Common
<i>Furcula bifida</i>	Poplar Kitten	Resident Local
<i>Stauropus fagi</i>	Lobster Moth	Resident Common
<i>Notodonta dromedarius</i>	Iron Prominent	Resident Common
<i>Notodonta ziczac</i>	Pebble Prominent	Resident Common
<i>Pheosia gnoma</i>	Lesser Swallow Prominent	Resident Common
<i>Pheosia tremula</i>	Swallow Prominent	Resident Common
<i>Ptilodon capucina</i>	Coxcomb Prominent	Resident Common
<i>Ptilodon cucullina</i>	Maple Prominent	Resident Local
<i>Pterostoma palpina</i>	Pale Prominent	Resident Common
<i>Drymonia dodonaea</i>	Marbled Brown	Resident Local
<i>Drymonia ruficornis</i>	Lunar Marbled Brown	Resident Common
<i>Clostera curtula</i>	Chocolate-tip	Resident Local
Sphingidae		
<i>Sphinx ligustri</i>	Privet Hawk-moth	Resident Common
<i>Mimas tiliae</i>	Lime Hawk-moth	Resident Common
<i>Smerinthus ocellata</i>	Eyed Hawk-moth	Resident Common
<i>Laothoe populi</i>	Poplar Hawk-moth	Resident Common
<i>Macroglossum stellatarum</i>	Humming-bird Hawk-moth	Immigrant (Resident?)
<i>Deilephila elpenor</i>	Elephant Hawk-moth	Resident Common
<i>Deilephila porcellus</i>	Small Elephant Hawk-moth	Resident Local
Zygaenidae		
<i>Zygaena filipendulae</i>	Six-spot Burnet	Resident Common

Scientific name	English name	National status
MICROLEPIDOPTERA		
Blastobasidae		
<i>Blastobasis adustella</i> (=lignea)		Common
Coleophoridae		
<i>Coleophora serratella</i>		Common
<i>Coleophora mayrella</i>		Common
<i>Coleophora kuehmella</i>		
<i>Coleophora follicularis</i>		Common
<i>Coleophora versurella</i>		Local
<i>Coleophora frischella</i>		Unconfirmed
Gelechiidae		
<i>Chrysoesthia drurella</i>		Common
<i>Brachmia inornatella</i>		Nationally Scarce
<i>Helcystogramma rufescens</i>		
<i>Teleiodes vulgella</i>		
<i>Oegoconia quadripuncta</i>		Common
Gracillariidae		
<i>Caloptilia semifascia</i>		
<i>Cameraria ohridella</i>	Horse Chestnut Leaf-miner	
Incurvariidae		
<i>Adela fibulella</i>		Common
<i>Adela reanmurella</i>		Common
Lyonetiidae		
<i>Bedellia sommitentella</i>		Local
Micropterigidae		
<i>Micropterix calthella</i>		Common
Momphidae		
<i>Mompha propinquella</i>		
Oecophoridae		
<i>Esperia sulphurella</i>		Common
<i>Carcina quercana</i>		Common
Pterophoridae:		
<i>Adaina microdactyla</i>		Local
Pyralidae		
<i>Acentria ephemerella</i>	Water Veneer	Common
<i>Calamotropha paludella</i>		Nationally Scarce
<i>Chrysoteuchia culmella</i>	Garden Grass-veneer	Common
<i>Crambus pascuella</i>	Grass-veneer	Common
<i>Crambus perlella</i>	Yellow Satin Veneer	Common
<i>Agriphila straminella</i>	Pearl Veneer	Common
<i>Agriphila tristella</i>		Common
<i>Evergestis pallidata</i>	Chequered Straw	Local
<i>Parapoynx stratiotata</i>	Ringed China-mark	Common
<i>Nymphula stagnata</i>	Beautiful China-mark	Common
<i>Cataclysta lemnata</i>	Small China-mark	Common
<i>Cryptoblabes bistriga</i>		Local

Scientific name	English name	National status
<i>Trachycera advenella</i>	(= <i>Numonia advenella</i>)	Common
<i>Phycita roborella</i>		Common
<i>Dioryctria abietella</i>		
<i>Myelois circumvoluta</i>	Thistle Ermine	Local
<i>Euzophera pinguis</i>		Local
<i>Phycitodes binaevella</i>		Common
<i>Hypsopygia costalis</i>	Gold Triangle (= Gold Fringe)	Common
<i>Orthopygia glaucinalis</i>		Common
<i>Pyralis farinalis</i>	Meal Moth	
<i>Endotricha flammealis</i>		Common
<i>Eurrhyncha hortulata</i>	Small Magpie	Common
<i>Phlyctaenia coronata</i>		Common
<i>Phlyctaenia perlucidalis</i>		Local
<i>Udea lutealis</i>		Common
<i>Udea ferrugalis</i>	Rusty-dot Pearl	Migrant
<i>Pleuroptya ruralis</i>	Mother of Pearl	Common
<i>Pyrausta aurata</i>		Local
<i>Schoenobius gigantella</i>		Nationally Scarce
<i>Scoparia ambigualis</i>		Common
<i>Dipleurina lacustrata</i> (<i>Eudonia lacustrata</i>)		Common
<i>Eudonia truncicolella</i>		Common
<i>Eudonia mercurella</i>		Common
Tineidae		
<i>Nemapogon clematella</i>		Nationally Scarce
<i>Monopis laevigella</i>	Skin Moth	
Tortricidae		
<i>Agapeta hamana</i>	Hook-marked Straw Moth	Common
<i>Agapeta zoegana</i>		Common
<i>Aethes rubigana</i>		Local
<i>Aethes smeathmanniana</i>		Local
<i>Cochylidia implicitana</i>		Local
<i>Cochylis dubitana</i>		Local
<i>Celypha striana</i>		Local
<i>Hedya ochroleucana</i>		Common
<i>Endothenia quadrimaculana</i>		Local
<i>Lobesia abscisana</i>		Local
<i>Bactra lancealana</i>		Common
<i>Endemis profundana</i>		Local
<i>Ancylis achatana</i>		Local
<i>Gypsonoma dealbana</i>		Common
<i>Epiblema nddmanniana</i>	Bramble Shoot Moth	Common
<i>Epiblema trimaculana</i>		Local
<i>Epiblema roborana</i>		Common
<i>Spilonota ocellana</i>	Bud Moth	Common
<i>Clavigesta purdeyi</i>	Pine Leaf-mining Moth	Local
<i>Rhyacionia pinicolana</i>		Local
<i>Cydia microgrammana</i>		Nationally Scarce

Scientific name	English name	National status
<i>Cydia nigricana</i>	Pea Moth	Common
<i>Cydia splendana</i>		Common
<i>Cydia pomonella</i>	Codling Moth	Common
<i>Cydia amplana</i>		Immigrant
<i>Cydia cosmophorana</i>		Local
<i>Cydia conicolana</i>		Local
<i>Dichrorampha simpliciana</i>		Local
<i>Celypha lacunana</i>		Common
<i>Pandemis corylana</i>	Chequered Fruit-tree Tortrix	Common
<i>Pandemis heparana</i>	Dark Fruit-tree Tortrix	Common
<i>Archips podana</i>	Large Fruit-tree Tortrix	Common
<i>Cacoecimorpha pronubana</i>	Carnation Tortrix	Local
<i>Aphelia paleana</i>	Timothy Tortrix	Local
<i>Clepsis consimilana</i>		Common
<i>Epiphyas postvittana</i>	Light Brown Apple Moth	Common
<i>Lozotaeniodes formosanus</i>		Local
<i>Cnephasia incertana</i>	Light Grey Tortrix	Common
<i>Acleris holmiana</i>		Local
<i>Acleris laterana</i>		Common
<i>Acleris sparsana</i>		Common
<i>Phalonidia manniana</i>		Nationally Scarce
Yponomeutidae		
<i>Ypsolopha sequella</i>		Local
<i>Yponomeuta evonymella</i>	Bird-cherry Ermine	Common

Table 2 Species list: butterflies.

Scientific name	English name	Scientific name	English name
Hesperiidae (Skippers)		Pieridae (Whites and Yellows)	
<i>Ochlodes sylvanus</i>	Large Skipper	<i>Gonepteryx rhamni</i>	Brimstone
<i>Thymelicus sylvestris</i>	Smaller Skipper	<i>Pieris napi</i>	Green veined White
Lycaenidae (Blues)		<i>Pieris brassicae</i>	Large White
<i>Plebeius agestis</i>	Brown Argus	<i>Anthocharis cardamines</i>	Orange Tip
<i>Polyommatus icarus</i>	Common Blue	<i>Pieris rapae</i>	Small White
<i>Celastrina argiolus</i>	Holy Blue	Satyridae (Browns)	
<i>Lycaena phlaeas</i>	Small Copper	<i>Pyronia tithonus</i>	Gate Keeper
Nymphalidae (Nymphalids)		<i>Maniola jurtina</i>	Meadow Brown
<i>Polygonia c-album</i>	Comma	<i>Aphantopus hyperantus</i>	Ringlet
<i>Vanessa cardui</i>	Painted Lady	<i>Pararge aegeria</i>	Speckled Wood
<i>Aglais io</i>	Peacock		
<i>Vanessa atalanta</i>	Red Admiral		
<i>Aglais urticae</i>	Small Tortoiseshell		

Flordon Common

Flies (Diptera)

Stuart Paston

Frequent visits were made to the Common in September and October 2009 and on occasions during spring, summer and autumn 2010. This period encompassed some extremes of weather with the Common often under snow during a prolonged cold winter whilst conditions were exceptionally dry in early autumn 2009 following negligible rainfall in August and September.

Sampling methods were restricted to direct observation and sweep-netting but information was also obtained from the by-catches of yellow water traps used by Tim Strudwick to sample Hymenoptera. Gall records via Rex Hancy have also augmented the species list.

The data obtained represents just a starting point in assessing the richness of the dipteran fauna at Flordon. Although an attempt was made to gather information across a wide range of families, some groups, most notably hoverflies (Syrphidae) and certain calyptrate families, received far more attention than others. Even within these better sampled groups some common species certain to occur were over-looked but nevertheless a good baseline of data was obtained overall and a total of 223 species in 37 families were recorded. Among species occurring were two Red Data Book (RDB) flies – the soldierfly *Odontomyia argentata* and the flesh-fly *Sarcophaga villeneuvei*, the latter of special significance, being new to East Anglia. A nationally scarce Tephritid fly *Merzomyia westermanni* was also found.

All references to the Common in this report relate to the main area east of Norwich Road, all of which is part of the SSSI.

The fen

Four cows graze the fen and their presence

is a significant factor in the diversity of the fly fauna as many recorded species have larvae that develop in cow dung. They are part of a wider group of coprophilous invertebrates known as the cow-dung community (Skidmore 1991).

Flies of the family Muscidae are well represented in this group and a good many species were prominent on the fen in autumn 2009. Foremost in terms of numbers encountered was *Myospila meditabunda*, one of a significant number of Muscid species whose larvae are obligate carnivores. The rate of growth of these larvae is often slow if there is insufficient live food within the dung and death will occur if there is no prey. The larvae of *M. meditabunda* are highly predatory and can exert a significant control on the populations of *Musca domestica* and *Stomoxys calcitrans* (Skidmore 1991). Other plentiful Muscid species of the cow-dung community were *Morellia simplex* and *Helina reversio* along with the spectacular noon fly *Mesembrina meridiana* (see photo p. 22).

At certain times males of the Yellow Dung-fly *Scathophaga stercoraria* could be found crowding about fresh dung to the exclusion of any other species.

Coprophilous soldierflies (Stratiomyidae) are conspicuous as adults. *Chloromyia formosa* was common across the site in 2010 but confirmation of the presence of *Sargus flavipes* and *S. iridatus* relied on records of singletons. In the case of *S. flavipes*, a female was identified from a spider web casualty found by Janet Negal in September 2009.

Among other recorded flies in this category were the hoverfly *Rhingia campestris* (see photo p. 22), seen in small numbers,

and Anthomyids in the genera *Adia*, *Hylemya*, *Hylemyza* and *Pegoplata*. *Pegoplata aestiva* was predominant among diptera in Tim Strudwick's yellow water traps in late April 2010.

The widespread treatment of cattle with antiparasitic drugs has impoverished the cow-dung community elsewhere by impacting on the survival and development of some early stages including diptera. However the cows at Flordon Common are untreated and there appears to be a healthy coprophilous community present.

Most records of coprophilous species were obtained by random sweeping of herbage or aerial sweeping over the grazed area but more targeted sampling over vegetation surrounding fresh cow pats was necessary to obtain records of smaller species such as members of Sepsidae which occur in very large numbers at suitable times. Additional species to those recorded are certain to be present.

The first mild days of 2010 occurred in the second half of March but there were few flies to be found on the fen area of the Common at this time. One of the earlier warm spring days occurred on April 10 when bee-flies *Bombylius major* were in evidence on the fen visiting flowers of Lesser Celandine *Ranunculus ficaria* in sheltered spots near scrub. The small Limoniid crane-fly *Ormosia lineata* was abundant at fen edge scrub bordering Norwich Road on this visit.

Larvae of the family Conopidae are endoparasites of bees and wasps and as a consequence the adults will occur where the hosts are common in flower-rich areas. Species of *Myopa*, very recognizable by their large inflated pale faces, can be found on warm spring days; *M. testacea* and *M. strandi*, overlooked by other sampling methods, were identified from water trap material collected on the fringes of the fen in late April.

The appearance of the large Empid *Rham-*

phomyia sulcata, first noticed on April 25, coincides with the emergence of Bibionid flies upon which it often preys. Several were present about a ditch where Marsh marigold *Caltha palustris* was in flower. The family Stratiomyidae (soldierflies) contains some particularly striking and colourful flies. Many species, often very small and challenging to find, occur on fens and marshes and are good indicators of habitat quality.

A number of these aquatic species were anticipated to occur at Flordon Common, one being *Odontomyia argentata* which was discovered on April 28. In early afternoon, despite rather gusty conditions, at least three well separated swarms containing five to six males were noticed hovering at around three metres on either side of a shallow ditch in the vicinity of hawthorn bushes. The interaction of the sun on the silver clothing of hairs on their abdomens made them very conspicuous as they moved lazily back and forth. Tim Strudwick subsequently notified me that he had found males of this species on willow blossom three days earlier. This is a Red Data Book 2 (Nationally Vulnerable) species which, though local, is widespread in East Anglia. Elsewhere in the UK it is far more sporadic in occurrence at sites to the south and west. In Britain the larvae have been found in the very shallow water of pools vulnerable to summer drought and the adults by shallow ditches which almost certainly provide the larval habitat at some sites (Stubbs and Drake 2001).

Cheilosia fraterna was one of the earlier wetland hoverflies to come to notice, with the first sighting made on this April visit whilst *Epistrophe eligans*, a hoverfly of much wider occurrence, was conspicuous among insect visitors to hawthorn blossom.

Among crane-flies, *Tipula luna* (see photo p. 22) was prominent on the open fen in late May whilst on the afternoon of 16 June I found *Ellipteroides lateralis* to be present in large numbers on the fen and about the

northern perimeter hedge. The hoverfly *Neoascia podagrica* was also frequently observed on this visit.

A visit made on June 21 provided the first evidence of two small aquatic soldierflies, *Nemotelus pantherinus* and *Oxycera nigricornis*. A pair of the former was found in cop. near scrub close to Norwich Road whilst *O. nigricornis* was frequent on the fen close to the entrance. Both are widespread in southern England, *N. pantherinus* having a strong association with seepages whilst *O. nigricornis* has been recorded in a wide range of situations including alder carr and partly shaded banks of streams which points to a potentially wide distribution at Flordon.

The majority of British Stiletto-flies of the genus *Thereva* are rare and the most frequently encountered, *T. nobilitata*, whilst widespread, is elusive rather than common in most districts (Stubbs & Drake 2001). *T. nobilitata* was present on the fen on June 21, occurring near hawthorn bushes not far from the entrance.

The majority of the recorded species of parasitic flies (Tachinidae) were found on the fen and its fringes, the herb-rich area close to Norwich Road comprising a particularly rich habitat owing to the prevalence of Water Mint *Mentha aquatica* and Common Nettle *Urtica dioica*. Water Mint supports Chrysomelid beetle larvae which are hosts of *Dufouria chalybeata* and *Macquartia grisea* as well as lepidopteran larvae which are parasitized by *Voria ruralis*. Common Nettle accounts for the presence of *Sturmia bella* which is a parasitoid of Vanessa butterfly larvae. This species was first discovered in Britain following a rearing in Hampshire in 1998 and is now widespread over the southern half of England. The significance of its occurrence on the Common (very noticeable in autumn 2009) relates to its potential impact on the populations of the Peacock *Inachis io* and Small Tortoiseshell butterfly *Aglais urticae*. The latter was seen

in large numbers at Flordon Common in 2009 and in parts of its range is now building up numbers after a period of sharp national decline that prompted research, coordinated by the University of Oxford, into the scale of parasitism by *Sturmia bella*. This has found no conclusive evidence that *S. bella* was a significant factor in the host's population crash but research is ongoing. *Phryxe vulgaris* and *Pelatachina tibialis*, both found on the fen, are also known to be parasitoids of Small Tortoiseshell.

Other species recorded here were *Lydella stabulans* which is a parasitoid of stem boring moth larvae in mostly wetland situations and *Siphona geniculata* which has been reared from crane fly larvae (Belshaw 1993).

In late summer, flowering Fleabane *Pulicaria dysenterica* is a magnet for many species of fly such as the tachinid *Eriothrix rufomaculata* whose host, Garden Grass-veneer *Chrysoteuchia culmella* is one of several plentiful species of Crambid moths occurring on the fen.

Several individuals of the Deer-fly *Lipoptena cervi* were swept from fen herbage in autumn 2009. Roe deer, known to occur on the Common, are likely to be the main host here for these blood-sucking parasites of the Hippoboscidae family.

A record of note at the beginning of September 2010 was the discovery of a female of the Nationally Scarce Tephritid fly *Merzomyia westermanni* which is dependant on Hoary Ragwort *Senecio erucifolius* growing on the fen. The larvae form galls in the flowerheads. This find represents a first record for vice-county 27 (East Norfolk). Nationally the species has a markedly southeastern distribution although there are some recent records from South Yorkshire.

In the latter part of September the crane fly *Tipula paludosa* was prominent on the fen amid a general scarcity of flies as nectar sources diminished.

In late October an unimposing flesh-fly (Sarcophagidae) obtained from one of Tim Strudwick's water traps on 23 April was identified by Tony Irwin as *Sarcophaga vil-leneuvei* – a RDB species not previously recorded from East Anglia. This very surprising addition to the species list appears to have been recorded only twice before in the UK since 1960 - from a site in Carmarthen-shire (1989) and near Bristol (2003). It occurs on marshes but its biology is unknown.

On an early November visit I found males of the Common Muscid *Hydrotaea armipes* swarming high about ash trees despite overcast, gusty conditions.

The southern edge of the Common

This area, which has a public footpath through it, was rough pasture in Burrell and Clarke's time but is now well-wooded with an ungrazed meadow at the eastern end. A stream flows along the southern perimeter.

Compared to the fen, limited recording was undertaken in this section but the area closest to the Norwich Road entrance proved productive. Here the path is flanked by scrub but several patches of short flower-rich grassland occur. Bramble thickets are numerous, attracting *Volucella* hoverflies to blossom in June and July, with both the conspicuous *V. bombylans* (see photo p. 22) and *V. pellucens* enjoying a good year. Large swarms of male *Fannia armata* were in evidence beneath trees close to the Norwich Road entrance with fewer numbers of the larger *F. lustrator*. On a late August visit to this area a single *Tachina grossa* was observed about water mint flowers north of the footpath. Hairy larvae of certain Lasiocampid moths seem to be the favoured hosts of this parasitic fly which is the largest European Tachinid. A great many hoverflies were also present, drawn to the extensive area of nectar available in sheltered conditions. Among the more conspicuous were *Volucella inanis* and *V. zonaria*, (see photo p. 22) relative newcomers to the

county that are now widespread following a northward expansion of range.

Further eastwards, the path, when not flanked by scrub, is bordered in summer by tall herbs and grasses with extensive areas of nettle in places. Much recording here was undertaken by scanning flowers of brambles and Hemp Agrimony *Eupatorium cannabinum*.

In early spring, before the advancement of plant growth, great numbers of *Muscina levida* were to be seen sunning themselves on fallen leaves on the south side of the alder woodland whilst males of *Paradelia intersecta*, an early emerging Anthomyid, were swarming in groups about alder branches. At the outset of June the crane-fly *Limonia phragmitidis* was numerous on the northern side of the footpath at the edge of the same stretch of woodland. Summer visits to this area produced records of the Pipunculid *Verrallia aucta*, a parasitoid of froghoppers *Neophilaenus lineatus* and *Philaenus spumarius* and also the Tephritid fly *Philophylla caesio*, whose larvae are known to mine in the leaf petioles of Common Nettle. At the beginning of November crane-flies *Erioptera lutea* and *Dicranomyia modesta* were present where exposed wet mud occurred on the footpath close to the alder woodland.

The path later enters shady woodland where very little sampling was undertaken although the edges of ditches and the stream yielded some records of crane-flies and Dolichopodids such as *Molophilus appendiculatus* and *Rhaphium crassipes*.

Females of the horsefly *Chrysops caecutiens* made life difficult with their constant pestering on an early July visit. They were rife along almost the whole extent of the public footpath prior to the meadow with no relief in the most shady parts of the woodland.

The meadow provides an abrupt transformation from shady woodland. The margins of the easternmost ditch that runs across it afford good habitat for the Limoniid crane-

fly *Erioconopa trivialis*, with a large aggregation of both sexes observed swarming about vegetation in early May. Another common cranefly recorded at this time was *Tricyphona immaculata* and the snipe-fly *Chrysopilus cristatus* was, as on the main fen, one of the most numerous flies encountered here. On a late July visit, sampling in the western corner close to the woodland produced records of Dolichopodids *Chrysotus femoratus* and *Dolichopus trivialis*, along with the hoverfly *Platycheirus rosarum* and the small black Calliphorid *Melanomyia nana*.

The stream, certainly at the eastern end of the wood, supports unidentified black-flies (Simuliidae) whose immature stages are aquatic. At certain times Empid flies are conspicuous as they swarm at varying heights over the water. *Rhamphomyia crassirostris* was numerous beside the Norwich Road bridge on June 2, whilst *Hilara monedula* was recorded toward the eastern end of the wood in late June, flying close to the water surface near the bank. Dolichopodids swarm over muddy margins and bankside vegetation with *Dolichopus unguilatus* extremely plentiful.

Concluding comments

It is clear that water levels and a diverse flora are key factors in maintaining a rich invertebrate fauna on the fen. Exposed wet mud is of great importance for a range of species, notably members of cranefly families, Dolichopodidae and Syrphidae (hoverflies). The cattle at Flordon ensure there is plenty of poached ground as well as creating the enriched conditions that support many hoverflies.

Hoverflies received a lot of recording attention and the apparent absence of some species (e.g. *Anasimyia*) is likely to be linked to the lack of favoured tall emergent vegetation bordering water. Bulrush *Typha latifolia*, for example, is missing from the fen and Sweet-grass *Glyceria* is of restricted occurrence, although both are present on the ungrazed eastern meadow.

The hawthorn bushes at the northern fringe of the fen are important to many fly species with the blossom a lure in spring. *Odontomyia argentata* is reported as a visitor to this source (Drake 1991) although it was not witnessed using it at Flordon Common. Flies will also utilise these bushes in other ways as places to assemble and mate, and they will provide vantage points for parasitic flies (Conopidae) and predatory flies (Asilidae) from which they can scan the surrounding foliage and herb layer for hosts and prey.

The scattered bramble thickets on the fen will also be of benefit to flies, being, for example, a component of ideal habitat for the recorded Stiletto-fly *Thereva nobilitata*.

Many species of fly breed in fungi and utilise dead wood and these are sure to be especially well-represented in the fauna occurring in the wooded parts of the southern edge of the Common which was insufficiently sampled.

In their report, Burrell and Clarke made no mention of Diptera but from their detailed flora and descriptions of the fen we can assume the presence of a rich fauna. In the following 100 years there will have been losses but also gains, especially as in recent times a good many species with a hitherto restricted southern distribution in Britain have extended their range northwards in response to a warmer climate. Other species have appeared in Britain for the first time such as the parasitic fly *Sturmia bella* which was recorded during the survey.

Today it is evident that the Common has great importance for its wetland flies particularly in the context of the surrounding South Norfolk countryside but the unexpected discovery of *Sarcophaga villeneuvei* during this survey, along with the presence of *Odontomyia argentata*, makes the site significant in a national context.

With such a large order of insects as Diptera the potential for further significant records

at Flordon is high and future research is likely to reinforce the Common's value.

Acknowledgments

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S Paston 25 Connaught Road, Norwich, Norfolk NR2 3BP.

Species list

The arrangement of families and nomenclature follows Chandler (1998) as updated on 1 October 2010.

LOWER DIPTERA

Tipulidae

Nephrotoma appendiculata
Nephrotoma flavescens
Nephrotoma quadrifaria
Nigrotipula nigra
Tipula (Acutipula) luna
Tipula (Acutipula) maxima
Tipula (Acutipula) vittata
Tipula (Lunatipula) fascipennis
Tipula (Lunatipula) lunata
Tipula (Pterelachisus) pabulina
Tipula (Savtshenkia) pagana
Tipula (Tipula) paludosa

Pediciidae

Dicranota bimaculata
Tricyphona immaculata

Limoniidae

Ellipteroides lateralis
Erioconopa trivialis
Erioptera fusculentata
Erioptera lutea
Molophilus appendiculatus
Ormosia hederatae
Ormosia lineata
Phylidorea ferruginea

Dicranomyia modesta

Limonia phragmitidis

Bibionidae

Biblio johannis
Biblio marci
Dilophus febrilis

Cecidomyiidae

Schizomyia galiorum [Marsh Bedstraw]*
Dasineura auritae [sallow]*
Dasineura pustulans [Meadow-sweet]*
Dasineura ulmaria [Meadow-sweet]*
Dasineura urticae [Common Nettle]*
Geocrypta galii [bedstraws]**
Iteomyia major [sallow]*
Jaapiella veronicae [Germander Speedwell]*
Rondaniola bursaria [Ground-ivy]*

BRACHYCERA

Rhagionidae

Chrysopilus asiliformis
Chrysopilus cristatus
Rhagio scolopaceus

Tabanidae

Chrysops caecutiens
Haematopota pluvialis
Tabanus autumnalis

Stratiomyidae

Beris vallata

Nemotelus pantherinus

Oxycera nigricornis

Pachygaster atra

Chloromyia formosa

Sargus flavipes

Sargus iridatus

Odontomyia argentata RDB2

Bombyliidae

Bombylius major

Therevidae

Thereva nobilitata

Asilidae

Machimus atricapillus

Empididae

Empis nigripes
Empis tessellata
Hilara monedula
Rhamphomyia (Megacyttarus) crassirostris
Rhamphomyia sulcata

Dolichopodidae

Chrysotus femoratus
Dolichopus picipes
Dolichopus signatus
Dolichopus trivialis
Dolichopus unguulatus
Poecilobothrus nobilitatus
Rhaphium crassipes
Campsicnemus curvipes

CYCLORRHAPHA

Platypezidae

Lindneromyia dorsalis

Syrphidae

Chalcosyrphus nemorum
Cheilosia fraterna
Cheilosia illustrata
Cheilosia impressa
Cheilosia variabilis
Chrysotoxum bicinctum
Chrysotoxum festivum
Epistrophe eligans
Episyrphus balteatus
Eristalis arbustorum
Eristalis horticola
Eristalis intricaria
Eristalis nemorum
Eristalis pertinax
Eristalis tenax
Eumerus strigatus
Eupeodes luniger
Helophilus pendulus
Leucozona lucorum
Melangyna cincta
Melanostoma mellinum
Melanostoma scalare
Merodon equestris
Myathropa florea
Neoascia podagrica
Platycheirus albimanus
Platycheirus clypeatus
Platycheirus peltatus
Platycheirus rosarum
Rhingia campestris
Sericomyia silentis
Sphaerophoria scripta
Syritta pipiens
Syrphus ribesii
Syrphus vitripennis
Tropidia scita
Volucella bombylaus
Volucella inauis
Volucella pellucens
Volucella zouaria
Xanthogramma pedissequum
Xylota segnis

Pipunculidae

Verrallia aucta
Pipunculus campestris

Conopidae

Conops quadrifasciatus
Myopa strandi
Myopa testacea

Sicus ferrugineus

Lonchaeidae

Setisquamalonchaea fumosa

Ulidiidae

Herina frondescentiae

Tephritidae

Myopites inulaedyssentericae
Urophora cardui
Merzomyia westermanni NS
Tephritis hyoscyani
Terellia ruficauda
Philophylla caesio

Sciomyzidae

Coremacera marginata
Elgiva sollicita

Sepsidae

Sepsis cynipsea
Sepsis fulgens
Themira annulipes

Agromyzidae

Agromyza flaviceps [Hop] †
Agromyza reptans [Nettle] †
Amauromyza flavifrons [Cam-
 pion] †
Amauromyza labiatarum [Dead
 nettle, Woundwort] †
Liriomyza amoena [Elder] †
Liriomyza strigata [polypha-
 gous] †
Phytomyza angelicae [Angel-
 ica] †
Phytomyza glechomae [Ground-
 ivy] †
Phytomyza obscurella [Ground-
 elder] †
Phytomyza tussilaginis [Colt's-
 foot] †

Opomyzidae

Opomyza florum
Opomyza germinationis

Chloropidae

Thaumatomyia uotata
Lipara lucens [gall on reed]

Heleomyzidae

Suillia affinis
Suillia imberbis

Sphaeroceridae

Copromyza equina
Sphaerocera curvipes

Campichoetidae

Campichoeta obscuripennis

Diastatidae

Diastata adusta

Hippoboscidae

Lipoptena cervi

Scathophagidae

Cordilurina albipes
Norellisoma spinimanum
Scathophaga stercocaria

Anthomyiidae

Anthomyia procellaris
Botanophila striolata
Hylemya vagans
Hylemya variata
Hylemyza partita
Egle rhinotmeta
Adia cinerella
Delia platura
Eustalomyia festiva
Subhylemya longula
Pegoplata aestiva
Pegoplata infirma
Alliopsis billbergi
Paradelia intersecta
Pegomya bicolor

Fanniidae

Fannia armata
Fannia lustrator
Fannia serena
Fannia similis
Fannia sociella

Muscidae

Coenosia humilis
Coenosia tigrina
Limnophora triangula
Hydrotaea armipes
Hydrotaea diabolus
Hydrotaea meteorica
Thricops diaphanous
Eudasyphora cyanella
Eudasyphora cyanicolor
Mesembrina meridiana
Morellia aenescens
Morellia simplex
Musca autumnalis
Pohietes lardarius
Muscina levida
Graphomyia maculata
Hebecnema vespertina
Myospila medietabunda
Heliua depuncta

Helina evecta
Helina reversio
Phaonia angelicae
Phaonia errans
Phaonia halterata
Phaonia rufipalpis
Phaonia rufiventris
Phaonia serva
Phaonia subventa
Phaonia tuguriorum

Calliphoridae

Bellardia pandia
Calliphora vicina
Lucilia caesar
Melanomya nana
Melinda viridicyanea
Pollenia rudis

Sarcophagidae

Sarcophaga (Discachaeta) punnula
Sarcophaga (Myorhina) vil-
leneuvei **RDB**
Sarcophaga carnaria
Sarcophaga subvicina

Tachinidae

Dufouria chalybeata
Eriothrix rufomaculata
Voria ruralis
Lydella stabulans
Phryxe vulgaris
Exorista rustica
Sturmia bella
Macquartia grisea
Pelatachina tibialis
Siphona geniculata
Tachina fera
Tachiua grossa

* From gall records supplied
by Rex Hancy.

** Record made June 2003.

† Determined from leaf
mines.

NS Nationally scarce.

RDB Red Data Book.

Beetles (Coleoptera)

Martin Collier

Burrell and Clarke (1910) made no mention of beetles in their review of the fauna and flora of Flordon Common and, until recent survey work, very few species have been recorded from the site in the intervening years. Although Norfolk has long been a popular county for beetle collectors and recorders, most visitors undoubtedly concentrate their searches in the larger and better-known sites in Broadland, Breckland and coastal areas. Relatively small and unknown sites such as Flordon Common have in many cases never been surveyed to any great extent, if at all, because they are outside of these well-visited areas. The entomological interest of such sites is therefore still largely to be determined.

All beetle records used for this report are from the period 1990 to 2010. The majority of these are the author's, from visits on 2nd May and 4th July 2009. A total of 135 beetle species have been recorded from Flordon Common, based on 161 records, but the true species total could easily be three or four times this number. The riffle beetles *Elmis aena* and *Limnius volckmari* are very common in the stony-bottomed stream along the southern boundary but the general water beetle fauna is somewhat disappointing in terms of diversity and rarity of individual species. This can often be the case in wetland sites fed by chalk springs, in Norfolk at least (G Nobes *pers. com.*). Most beetles were recorded by the author by general sweeping and beating of foliage or by sieving plant litter from tussocks etc. It should be noted, however, that cow dung is currently providing an important habitat for several coprophagous species. Some of these species have few county records, although this is no doubt due, in part at least,

to under-recording from this specialised habitat.

Details for species of local or national interest are given below; all were found by the author during 2009 unless stated otherwise. Nomenclature is based on Duff (2008).

Pachyrhinus lethierryi (Curculionidae) is one of several weevils added to the British list in recent years. First found in 2003 in Hertfordshire but not identified until 2006, the beetle appears well established in south-east England (Plant *et al.* 2006) and will no doubt spread much further. It feeds on various species of Cupressaceae, including the ubiquitous 'leylandii' so widely used for hedging and as an ornamental tree throughout Britain. Peter Aspinall noticed large numbers of the weevil on a wooden fence below a large cypress on the boundary of the northern edge of the Common and his garden in early May 2009. This is the first Norfolk record and it is yet to be found at any other sites in the county, although this must surely change over the next few years. There have been records for Suffolk and Essex (Nash *et al.* 2010).

Orchestes testaceus (Curculionidae) is a scarce but widespread weevil in Britain and its national status (Red Data Book Category 2 – Vulnerable) should probably be downgraded somewhat in the light of recent records (see photo p. 21). It feeds exclusively on Alder *Alnus glutinosa*. There are a few very old Norfolk sites for this species but the first modern record was from Santon Downham in 1987 (Collier 1989), although the alder plantation at this site has unfortunately since been clear-felled. It has subsequently been found by the author on several occasions at Stanford Training

Area, but Flordon Common effectively constitutes one of only two sites in Norfolk with extant populations. It was found in good numbers on young alders in both May and July.

Cionus tuberculatus (Curculionidae) is not considered to be a scarce weevil nationally but it has been recorded rather infrequently in Norfolk. Robert Maidstone found it at three localities in the same general area of south-east Norfolk in 2007 but there are no other modern records. It feeds on figworts *Scrophularia* spp., particularly Water Figwort *S. auriculata*, and several examples were found on this foodplant at Flordon Common in July.

Ptilium exaratum (Ptiliidae) is one of our smallest beetles at just over 0.5 mm long. It is a nationally scarce species, usually associated with decaying vegetation or dung. A single example was taken from dry cow dung at Flordon Common in May and was subsequently identified by Michael Darby, an expert in this difficult family. There is only one other Norfolk record, from Sheringham (date not known but pre-1975).

Philonthus parvicornis (Staphylinidae) is a local rove beetle that has only been recorded once before in Norfolk, at Ringland in 1876. Two male examples of this species were found in cow dung in May.

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M Collier Hillside Cottage, Syleham, Eye IP21 4LL

Species list

Anobiidae

- Anobium inexpectatum*
Ochina ptinoides
Catapion seniculus
Eutrichapion viciae
Perapion curtirostre
Protapion assimile
Protapion fulvipes
Protapion trifolii
Stenopterapion tenue

Byturidae

- Byturus tomentosus*

Cantharidae

- Cantharis livida*
Cantharis pallida
Cantharis thoracica
Rhagonycha fulva

Carabidae

- Bembidion articulatum*
Bembidion properans
Demetrias atricapillus
Elaphrus cupreus
Elaphrus riparius

Cerambycidae

- Rutpela maculata*

Chrysomelidae

- Altica lythri*
Aphthoua nonstriata
Cassida rubiginosa
Chrysolina polita
Epitrix pubescens
Galerucella lineola
Galerucella tenella
Longitarsus dorsalis
Longitarsus luridus
Neocrepidodera transversa

- Oulema melanopus/rufocyanea* agg.
Phaedon armoraciae
Phaedon cochleariae
Phyllotreta atra
Phyllotreta undulata
Sphaeroderma testaceum
- Ciidae**
Cis boleti
- Coccinellidae**
Calvia quattuordecimguttata
Chilocorus renipustulatus
Coccinella septempunctata
Exochomus quadripustulatus
Harmonia axyridis
Propylea quattuordecimpunctata
- Cryptophagidae**
Atomaria testacea
Ootypus globosus
- Curculionidae**
Anthonomus pedicularius
Ceutorhynchus obstrictus
Ceutorhynchus pallidactylus
Ceutorhynchus typhae
Cionus hortulanus
Cionus tuberculosus
Curculio betulae
Hylesinus toranio
Hypera nigrirostris
Hypera zoilus
Mecinus pascuorum
Mogulones asperifoliarum
Nedyus quadrimaculatus
Orchestes testaceus
Pachyrhinus lethierryi
Phyllobius glaucus
Polydrusus cervinus
Sitona lineatus
Trichosirocalus troglodytes
Tychius picirostris
- Dytiscidae**
Agabus bipustulatus
Agabus sturmii
Hydroporus gyllenhalii
Hydroporus incognitus
Hydroporus memnonius
Hydroporus neglectus
Hydroporus pubescens
Ilybius ater
Ilybius chalconatus
- Ilybius fuliginosus*
Ilybius quadriguttatus
Platambus maculatus
- Elateridae**
Adrastus pallens
Athous haemorrhoidalis
Melanotus castanipes/villosus agg.
- Elmidae**
Elmis aenea
Limnius volckmari
- Gyrinidae**
Gyrinus substriatus
- Haliplidae**
Haliplus lineatocollis
- Histeridae**
Onthophilus striatus
- Hydrophilidae**
Anacaena globulus
Anacaena limbata
Cercyon haemorrhoidalis
Cercyon impressus
Cercyon lateralis
Cercyon melanocephalus
Cercyon pygmaeus
Coelostoma orbiculare
Cryptopleurum minutum
Helochares lividus
Hydrobius fuscipes
Laccobius bipunctatus
Sphaeridium lunatum
Sphaeridium marginatum
- Latridiidae**
Corticicara gibbosa
- Kateridae**
Kateretes pusillus
- Melyridae**
Malachius bipustulatus
- Monotomidae**
Monotoma brevicollis
- Nitidulidae**
Meligethes aeneus
Meligethes morosus
- Oedemeridae**
Oedemera lurida
Oedemera nobilis
- Ptiliidae**
Ptiliola kunzei
- Ptilium exaratum*
- Rhynchitidae**
Deporaus betulae
- Scarabaeidae**
Aphodius ater
Aphodius sphacelatus
Aphodius sticticus
Melolontha melolontha
Oxyomus sylvestris
- Scirtidae**
Cyphon coarctatus
Scydmaenidae
Stenichnus collaris
- Staphylinidae**
Aleochara intricata
Anotylus rugosus
Anotylus tetracarínatus
Autalia rivularis
Bisnius fimetarius
Bolitobius cingulatus
Eusphalerum luteum
Lathrobium brunniipes
Lesteva longoelytrata
Oxytelus laqueatus
Philonthus parvicornis
Philonthus sanguinolentus
Philonthus varians
Stenus bimaculatus
Stenus flavipes
Stenus impressus
Stenus lustrator
Tachinus rufipes
-

Flordon Common

Hemiptera (Bugs)

compiled by *Bob Ellis*

No systematic survey of bugs was conducted but several have been noted recently on the Common, mainly by Geoff Nobes in 2009. The Pied Shield-bug *Tritomegus bicolor* was reported by Francis Farrow. One psyllid was recorded as a gall (see paper). All are widely scattered or common species of no special conservation concern.

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Species list

HETEROPTERA (true bugs)

Cydnidae

Tritomegus (Sehirus) bicolor Pied Shield-bug

Lygaeidae (ground bugs)

Scolopostethus cf. affinis

Anthocoridae (flower bugs)

Anthocoris confusus

Anthocoris nemorum

Miridae (plant bugs, capsids)

Calocoris alpestris

Leptopterna dolabrata Meadow Plant Bug

Liocoris tripustulatus

Polymerus nigrita

Gerridae (pond skaters)

Gerris lacustris Common Pond Skater

Notonectidae (backswimmers)

Notonecta glauca Common Backswimmer

HOMOPTERA, Auchenorrhyncha (froghoppers, planthoppers etc.)

Aphrophoridae

Aphrophora alni Alder Spittlebug

Philaenus spumarius Common Froghopper

HOMOPTERA, Psylloidea (psyllids)

Psyllopsis cf. fraxini

Flordon Common

Dragonflies and damselflies (Odonata)

Pam Taylor

Three species of dragonfly and four species of damselfly were recorded from the common in the summer of 2005 by Pam Taylor and there was evidence of breeding (copulating pairs and ovipositing females) for two of the damselflies, Large Red Damselfly *Pyrrhosoma nymphula* and Azure Damselfly *Coenagrion puella*. Additional casual records of some of these species were also made in 2009 by Geoff Nobes. On 7th August 2010 a single Ruddy Darter *Sympetrum sanguineum* was recorded at the site by Stuart Paston.

Dr P Taylor Decoy Farm, Decoy Rd, Potter Heigham, Great Yarmouth NR29 5LX

Species list

Scientific name	English name
Zygoptera (Damselflies)	
<i>Pyrrhosoma nymphula</i>	Large Red Damselfly
<i>Coenagrion puella</i>	Azure Damselfly
<i>Enallagma cyathigerum</i>	Common Blue Damselfly
<i>Ischnura elegans</i>	Blue-tailed Damselfly
Anisoptera (Dragonflies)	
<i>Libellula quadrimaculata</i>	Four-spotted Chaser
<i>Libellula depressa</i>	Broad-bodied Chaser
<i>Orthetrum cancellatum</i>	Black-tailed Skimmer
<i>Sympetrum sanguineum</i>	Ruddy Darter

Flordon Common

Spiders

Pip Collyer

A total of 44 species from 13 families were recorded during a number of visits in 2009. Whilst this is undoubtedly well short of a complete list of the spiders on Flordon Common, it was pleasing to find a good range of the wetland species one would expect on such a site and some of the less common wetland specialists too.

Recording was carried out in different locations throughout the Common using a sweep net, a vacuum sampler and by sieving litter. In the wet area around the pond and dykes immediately south of the entrance from the Hapton Road, the tiny money spider (Linyphiidae) *Erigonella ignobilis* whose status is described as “very local” in the

Figure 1. Distribution of *Erigonella ignobilis*.



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Figure 2. Distribution of *Crustulina sticta*.

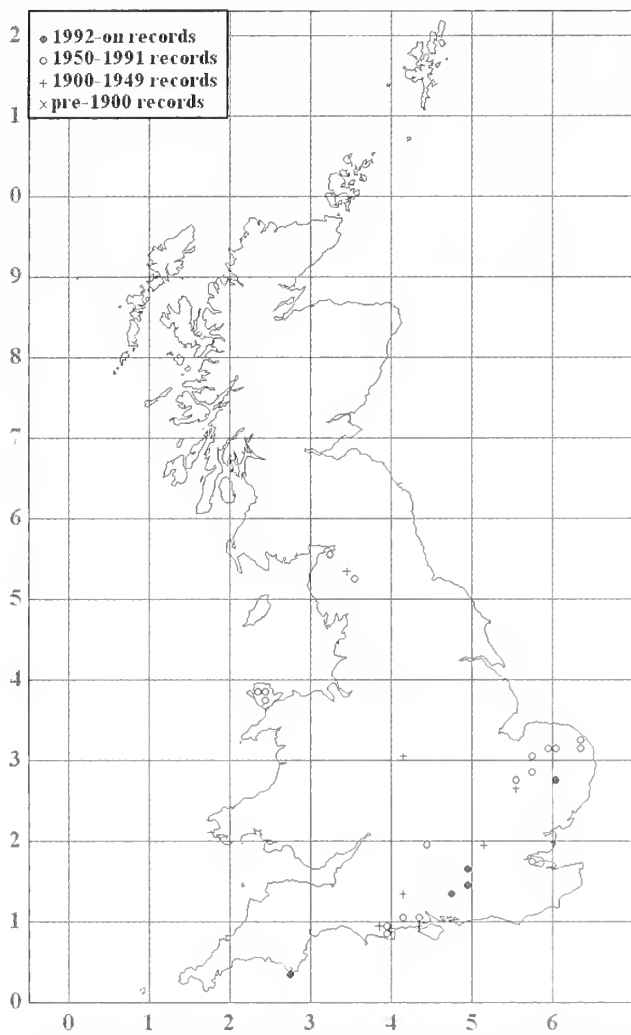


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Provisional Atlas of British Spiders (Harvey *et al.* 2002) and for which there are only scattered records (Figure 1) was present in good numbers in the early Spring. A single female of *Crustulina sticta* (Theridiidae) Nationally Scarce (Notable B), was found further to the east (Figure 2 and illustration on page 24) A female and several juveniles of the jumping spider *Sitticus caricis* (Salticidae), also Nationally Scarce (Notable B), were found in the dense sedge south of the main east/west ditch (Figure 3).

Other records of note were *Floronia bucculenta* (Linyphiidae) a generally uncommon spider and *Millerania inerrans* (also Linyphiidae) a frequent aeronaut which was found

Figure 3. Distribution of *Sitticus caricis*.



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on a fence post on the northern boundary and for which there are few records from Norfolk.

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PD Collyer 9 Lowther Road, Norwich, Norfolk NR4 6QN

Species List

Mimetidae

Ero cambridgei

Theridiidae

Episinus angulatus

Crustulina sticta NB

Linyphiidae

Walckenaeria unicornis

Gnathonarium dentatum

Dismodicus bifrons

Pocadicnemis juncea

Oedothorax gibbosus

Oedothorax gibbosus f. *tuberosus*

Oedothorax retusus

Micrargus herbigradus s.str.

Erigonella ignobilis

Savignia frontata

Diplocephalus latifrons

Milleriana inerrans

Erigone dentipalpis

Erigone atra

Tallusia experta

Bathyphanes gracilis

Kaestneria pullata

Floronia bucculenta

Taranucnus setosus

Lepthyphantes tenuis

Neriene clathrata

Tetragnathidae

Pachygnatha clercki

Pachygnatha degeeri

Metellina mengei

Araneidae

Araneus diadematus

Araneus marmoreus var. *pyramidatus*

Nuctenia umbratica

Lycosidae

Pardosa pullata

Pardosa prativaga

Pardosa amentata

Pardosa nigriceps

Pirata hygrophilus

Pisauridae

Pisaura mirabilis

Dictynidae

Dictyna arundinacea

Dictyna uncinata

Clubionidae

Clubiona reclusa

Clubiona subtilis

Zoridae

Zora spinimana

Philodromidae

Tibellus oblongus

Thomisidae

Xysticus ulmi

Ozyptila brevipes

Salticidae

Sitticus caricis NB

Flordon Common

Crustacea

compiled by *Bob Ellis*

A number of freshwater and terrestrial crustaceans, mainly woodlice, have been recorded from the common in recent years. Only the latest record for each species is listed below.

Species list

Scientific name	English name	Recorder	Date
AMPHIPODA			
Gammaridae			
<i>Gammarus pulex</i> (Linnaeus)		Roy Baker	2009
ISOPODA			
Asellidae			
<i>Asellus aquaticus</i> (Linnaeus)		Roy Baker	2009
Trichoniscidae			
<i>Haplophthalmus danicus</i> Budde-Lund		David Richmond	2009
<i>Haplophthalmus menzei</i> agg.		John Goldsmith	1986
<i>Trichoniscus pusillus</i> Brandt	Common Pygmy Woodlouse	David Richmond	2009
Oniscidae			
<i>Oniscus asellus</i> (Linnaeus)	Common Shiny Woodlouse	David Richmond	2009
Philosciidae			
<i>Philoscia muscorum</i> (Scopoli)	Common Striped Woodlouse	David Richmond	2009
Porcellionidae			
<i>Porcellio scaber</i> Latreille	Common Rough Woodlouse	David Richmond	2009
<i>Porcellio dilatatus</i> Brandt		Dick Jones	1986
Armadillidiidae			
<i>Armadillidium vulgare</i> Latreille	Common Pill Woodlouse	Dick Jones	1986

Flordon Common

Myriapoda (millipedes and centipedes)

compiled by *Bob Ellis*

No systematic survey of millipedes and centipedes was conducted. In 1986 both John Goldsmith and Dick Jones recorded species on the Common, and Dick Jones kindly

identified a few specimens collected by Janet Negal in 2010. None are designated as being of conservation concern.

Species list

Species	English name	Date
DIPLOPODA (millipedes)		
<i>Glomeris marginata</i>	Pill Millipede	1986
<i>Brachydesmus superus</i>		1986
<i>Polydesmus denticulatus</i>		1986
<i>Polydesmus sp. (immature)</i>		2010
<i>Ophiuulus pilosus</i>		1986
<i>Cylindroiulus punctatus</i>	Blunt-tailed Snake Millipede	2010
CHILOPODA (centipedes)		
<i>Geophilus electricus</i>		1986
<i>Necrophloeophagus flavus</i>		1986
<i>Brachygeophilus truncorum</i>		1986
<i>Lithobius forficatus</i>		2010
<i>Lithobius crassipes</i>		1986

Flordon Common

Leeches (Annelida: Hirudinea)

compiled by *Bob Ellis*

Several leeches have been recorded from the Common and the stream in recent years.

Species list

Scientific name	English name	Recorder	Date
Glossiphoniidae			
<i>Glossiphonia complanata</i> (Linnaeus)		Roy Baker	2009
<i>Helobdella stagnalis</i> (Linnaeus)		Tony Leech	2010
Erpobdellidae			
<i>Erpobdella octoculata</i> (Linnaeus)	'Dog Leech'	Roy Baker	2009
Haemopidae			
<i>Haemopsis sanguisuga</i> (Linnaeus)	Horse Leech	Peter Aspinall	2009

RW Ellis 11 Havelock
Road, Norwich NR2 3HQ

Mollusca

Roy Baker & Derek Howlett

History of molluscan recording

Since the late 19th century naturalists have visited Flordon Common to study the snail, slug and mussel communities. The following review is a summary of the records left by these individuals of a site which has changed over the years. The Common is much drier now than at the beginning of the 20th Century when earlier descriptions of the marsh showing pools and wet ditches no longer holds. There are a number of ditches, narrow and relatively deep, but their present condition compares unfavourably with that of earlier times. The two ponds at the western section of the Common no longer exist and with them a number of the freshwater snails recorded from the site. The springs still flow but climate changes and water extraction in the area limit their output. Today they would be classified as seepages rather than springs.

The first major molluscan survey of the Common was made by Arthur Mayfield (1869-1956) in the first decade of the 20th Century. Arthur Mayfield was born in Norwich but he spent his working life teaching in Mendlesham in High Suffolk. He wrote a number of papers in the *Transactions of the Norfolk and Norwich Naturalists' Society* and the *Journal of Conchology* where he listed 23 species at Flordon. Thirty years later the distinguished expert Arthur Erskine Ellis, author of *British Snails* (1926), visited the Common in search of the rare Narrow-mouthed Whorl Snail *Vertigo angustior*. Arthur Ellis taught at Epsom College but he spent his summer months with his parents at Thorpe St Andrew. His records for Flordon were published in the *Transactions of the Norfolk and Norwich Naturalists' Society*.

He identified 49 species, although at least one, *Candidula intersecta*, was discovered in a nearby sand pit on the Braconash road. In a 1974 paper describing the occurrence of *Vertigo angustior* in Great Britain, Norris and Colville gave a detailed description of the habitat of the snail (the authors incorrectly stated that they were the first people to discover living specimens at Flordon) together with a list of other species found on the Common. Norris and Colville took a borehole sample and related the molluscan fauna to a changing landscape since about 3000 BC which showed a change from woodland dominated by ash to a damper meadow-fen community.

In 1984 the Norwich conchologist and dentist KS Erskine collected from Flordon when he reaffirmed earlier records and added one species *Pisidium obtusale* to the lists. Ian Killeen, author of the *Land and Freshwater Molluscs of Suffolk* (1992) surveyed the Common in research reports for English Nature advising on the populations and management strategies for the Narrow-mouthed Whorl Snail. Killeen included a list of 25 mollusc species collected at Flordon during the surveys. Roy Baker and Derek Howlett, specializing in the mollusca, collected from the grassland swards, marsh, alder carr and the tributary stream of the River Tas. A number of new species records for the Common have emerged from this survey.

Geology

The Common has a large area of marshy meadows which slope to a small tributary of the River Tas. Geologically it lies on the Upper Chalk and is overlain by a series of ferruginous sands and gravels of the Norwich Crag series and sand-gravels with calcareous loamy boulder clay of glacial origin.

Alluvial and peat deposits cover most of the geology in the wetter parts of the Common. The transition from the sandy-gravel upper slopes to the wetter alluvial-peat of the Common basin provides a diversity of habitats for mollusca.

Management

In 1910 the Common supported horses, cattle, geese, hens, ducks and turkeys and a small portion of the western common yielded good hay; several areas of sedge and rush were cut for litter and the hedges of ash and hazel for incidental uses (Burrell & Clarke 1910). In the 1960s and 1980s the Common was managed by light mixed grazing of donkeys, ducks, geese and occasional cattle by the commoner the late Mrs Ida Holmes. Recent management uses light cattle grazing, four to five beasts and, until very recently, a pony.

Current status of molluscs

The biggest change in the one hundred years since Burrell and Clarke described Flordon Common is the loss of standing water habitats, other than a few remaining ditches with poor quality waters. In the early 19th Century the Common was much wetter and many of the marshy portions were impassable with numerous pools. Burrell and Clarke noted six springs but they did observe that the meadow-fen communities were much drier than previously. Many of the species noted by Mayfield (1909) are no longer present as their freshwater habitats have been lost but they are recorded by Norris and Colville (1974) in the core sample only as sub-fossil. This is especially the case for the orb and pea mussels. Of the eight species of Pea mussels only *Pisidium personatum* exists, attached to mosses in the wetter reeded sites and *P. subtrucatum* and *P. nitidum* in the silts in the quieter sections of the stream.

A notable loss from the 1910 survey is *Oxy-loma sarsi*. This is a Red Data Book 2 (RDB2) snail which has been in decline nationally. It is currently recorded from a small

number of sites in the Norfolk and Suffolk Broads in grazing marshes where it inhabits richly vegetated fens at the margins of rivers, lakes and drainage ditches. The drainage dykes found on Flordon Common are in such a poor condition that they do not meet the basic requirements for the snail's survival.

The Narrow-mouthed Whorl Snail *Vertigo angustior* (RDB1) is an extremely small snail, being under 2 mm in height. It has four moderately convex whorls with fine sculptured striae. The sinistral mouth is subtriangular with four teeth. Outside Norfolk it is known from a further ten UK sites and it was originally known in Norfolk only from the Flordon site but recent work by Baker, Holyoak and Howlett (2007) has discovered the snail in a total of nine locations in Norfolk. Flordon remains an important site for this exceedingly rare mollusc. It can be found across the Common in the permanently damp areas where the soils are friable and not the heavy clay form of much of South Norfolk. The vegetation is relatively open where trees and tall herbs are absent. Lightly grazed turf, often of fine grasses and/or sedges is preferred. Killeen (1997) noted maximum densities of 950 per m² and later in 2001 mean densities of 340 per m². He identified a number of transect lines and argued that the snails should be monitored over subsequent years. This has not occurred and in fact a shallow turf pond has been dug across some of the monitoring area. The Narrow-mouthed Whorl Snail maintains healthy populations across the Common. How long the snail has lived on the Common can tentatively be said to be fairly short since in the core taken by Norris and Colville sub-fossils were found only in the top 33 cm when marshy meadows dominated the site.

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Dr RE Baker 126, Pelican Row, Norwich Road, Tacolneston, Norwich NR16 1AL

D Howlett 6 New Inn Hill, Rockland St. Mary, Norfolk NR14 7HP

Species list

Hydrobiidae

Potamopyrgus antipodarum (Gray) Howlett & Baker 2009 (abundant in stream)

Valvatidae

Valvata cristata Müller Mayfield 1909; Norris & Colville 1972 (sub-fossil)

Bithynidae

Bithynia tentaculata (L.) Norris & Colville 1972 (sub-fossil)

Planorbidae

Planorbis carinatus Müller Norris & Colville 1972 (sub-fossil)

Anisus vortex (L.) Mayfield 1909.

Bathyonphalus contortus (L.) Norris & Colville 1972 (sub-fossil); Howlett & Baker 2009 (in stream)

Gyraulus albus (Müller) Norris & Colville 1972 (sub-fossil)

Gyraulus crista (L.) Norris & Colville 1972 (sub-fossil)

Ellobiidae

Carychium minimum Müller Mayfield 1909; AE Ellis 1940; Norris & Colville 1972 (sub-fossil & living); Killeen 1997; Howlett 1997: Howlett & Baker 2009

Carychium tridentatum (Risso) Norris & Colville 1972 (sub-fossil & living); Killeen 1997; Howlett & Baker 2009

Physidae

Alpeya hypnorum (L.) AE Ellis 1947

Lymnaeidae

Lymnaea truncatula (Müller) Mayfield 1893; Mayfield 1909; Norris & Colville 1972 (sub-fossil); Howlett & Baker 2009

Lymnaea palustris (Müller) Howlett & Baker 2009 (in wetter parts of fen)

Lymnaea stagnalis (L.) Mayfield 1909

Lymnaea peregra (Müller). Mayfield 1909; Mayfield 1910; Norris & Colville 1972 (sub-fossil)

Succineidae

Succinea putris (L.) Killeen 1997; Howlett & Baker 2009 (in fen)

Oxyloma sarsi (Esmark). Mayfield 1909

Cochlicopidae

- Cochlicopa lubrica* (Müller). Mayfield 1910; Norris & Colville 1972 (sub-fossil & living); Killeen 1997; Howlett & Baker 2009
- Cochlicella lubricella* Porro. Norris & Colville 1972 (sub-fossil); Killeen 1997

Vertiginidae

- Columella edentula* (Drap.). Killeen 1997; Howlett & Baker 2009
- Vertigo antivertigo* (Drap.) Mayfield 1909; AE Ellis 1947; Norris & Colville 1972 (sub-fossil & living); Killeen 1997
- Vertigo substriata* (Jeffreys). AE Ellis 1947; Norris & Colville 1972 (sub-fossil & living); Killeen 1997
Howlett 1997
- Vertigo pygmaea* (Drap.). Mayfield 1893; Mayfield 1909; AE Ellis 1947; Erskine 1984; Norris & Colville 1972 (sub-fossil & living); Killeen 1997; Howlett & Baker 2009
- Vertigo angustior* Jeffreys. Mayfield 1893; Mayfield 1909; AE Ellis 1947; Baker 1972; Norris & Colville 1972 (sub-fossil & living); Erskine 1984; Killeen 1997; Howlett & Baker 2009

Punctidae

- Punctum pygmaeum* (Drap.). Mayfield 1909; Norris & Colville 1972 (sub-fossil & living); Howlett 1997; Howlett & Baker 2009

Pupillidae

- Pupilla muscorum* (L.). Mayfield 1893; Mayfield 1910; Killeen 1997
- Lauria cylindracea* (da Costa). Erskine 1979; Killeen 1997; Howlett & Baker 2009

Valloniidae

- Vallonia costata* (Müller) Norris & Colville 1972 (living); Killeen 1997; Howlett 1997
- Vallonia pulchella* (Müller) Mayfield 1895; Mayfield 1909; Norris & Colville 1972 (sub-fossil); Killeen 1997; Howlett & Baker 2009
- Vallonia excentrica* Sterki Norris & Colville 1972 (sub-fossil); Killeen 1997
- Acanthinula aculeata* (Müller) Norris & Colville 1972 (living); Killeen 1997; Howlett 1997

Discidae

- Discus rotundatus* (Müller) Killeen 1997; Howlett 1997; Howlett & Baker 2009

Arionidae

- Arion ater* (L.) Mayfield 1909; Howlett & Baker 2009 (in ride near alder carr)
- Arion intermedius* Normand Mayfield 1910; Norris & Colville 1972 (living); Howlett & Baker 2009 (in fen)

Vitrinidae

- Vitrina pellucida* (Müller) Killeen 1997. Howlett 1997
- Vitrea crystallina* (Müller) Mayfield 1910; Norris & Colville 1972 (sub-fossil & living); Killeen 1997; Howlett 1997; Howlett & Baker 2009
- Vitrea contacta* (Westerlund) Mayfield 1910; Norris & Colville 1972 (living); Killeen 1997

Zoniitidae

- Aegopinella pura* (Alder) Killeen 1997; Howlett & Baker 2009
- Aegopinella nitidula* (Drap.) Mayfield 1910; AE Ellis 1947; Norris & Colville 1972 (sub-fossil & living); Killeen 1997; Howlett 1997
- Oxychilus alliarus* (Miller) Killeen 1997; Howlett 1997; Killeen 2001; Howlett & Baker 2009 (in marsh litter)
- Oxychilus helveticus* (Blum) Howlett & Baker 2009
- Nesovitrea hammonis* (Ström) Norris & Colville 1972 (sub-fossil & living); Killeen 1997; Howlett & Baker 2009 (in marsh litter)
- Zonitoides nitidus* (Müller) Killeen 1997; Howlett & Baker 2009 (in marsh litter)

Limacidae

- Limax maximus* L. Howlett & Baker 2009 (in alder carr)

Agriolimacidae

Deroceras laeve (Müller) Norris & Colville 1972 (living)

Euconulidae

Euconulus fulvus (Müller) Mayfield 1910; Norris & Colville 1972 (sub-fossil & living); Howlett 1997 (in marsh-fen litter)

Euconulus alderi (Gray) Erskine 1984; Killeen 1997; Howlett & Baker 2009 (in marsh-fen litter)

Ferussaciidae

Ceciliodes acicula (Müller) Lindley-Jones 1938; Howlett & Baker 2009. Recent sub-fossil in stream siftings

Clausilidae

Clausilia bidentata (Ström.) Norris & Colville 1972 (living); Howlett 1997; Killeen 1997; Howlett & Baker 2009 (on alder in carr)

Helicidae

Candidula intersepta (Poiret) Mayfield 1908 (in sand pit)

Monacha cautiana (Mont.) Howlett & Baker 2009

Ashfordia granulata (Alder) Mayfield 1910; Howlett & Baker 2009 (in fen)

Trichia hispida (L.) Norris & Colville 1972 (sub-fossil & living); Howlett 1997; Howlett & Baker 2009

Trichia plebeia (Drap.) Killeen 1997

Trichia striolata (Pfeiffer) Howlett & Baker 2009

Arianta arbustorum (L.) Lindley Jones 1938; Killeen 2001; Howlett & Baker 2009 (abundant in ride between alder carr and stream)

Helicigona lapicida (L.) AE Ellis 1947 (in pit near Braconash Road opposite entrance to Hall).

Cepaea nemoralis (L.) Baker 1972; Norris & Colville 1972 (sub-fossil & living); Killeen 1997; Howlett & Baker 2009

Cepaea hortensis (Müller) Howlett & Baker 2009 (along ride near stream)

Helix aspersa Müller Howlett & Baker 2009 (along ride between alder carr and stream; alder carr, and on mature trees bordering the Common)

Sphaeriidae

Sphaerium corneum (L.) Norris & Colville 1972 (sub-fossil)

Pisidium amnicum (Müller) Norris & Colville 1972 (sub-fossil)

Pisidium personatum Malm. Norris & Colville 1972 (sub-fossil & living); Erskine 1984; Howlett & Baker 2009 (found attached to mosses in wetter sites)

Pisidium casertanum (Poli) Norris & Colville 1972 (sub-fossil & living)

Pisidium milium (Held) Norris & Colville 1972 (sub-fossil)

Pisidium subtruncatum Malm Norris & Colville 1972 (sub-fossil). Howlett & Baker 2009 (in stream)

Pisidium hibernicum Westerlund Norris & Colville 1972 (sub-fossil)

Pisidium nitidum Jenyns Norris & Colville 1972 (sub-fossil & living); Howlett & Baker 2009 (in stream)

Pisidium pulchellum Jenyns Mayfield 1909 (in pond at west end of the Common which no longer exists)

Pisidium obtusale (Lamarck) Erskine 1984

WH Burrell and WG Clarke

Alec Bull

The name WG Clarke will be well known to most people as the person who gave Breckland that name. Born in Yorkshire of East Anglian parents, the family moved to Thetford when William was a lad where he was educated at Thetford Grammar School. He was apprenticed in his father's printing business at the age of 14, which would have been in 1891. By 1897 he had become a journalist on the staff of the *Norwich Mercury* and was then based in Norwich.

Swann (Petch & Swann 1968) states that he at first devoted much spare time to Archaeology and Geology, later taking up Botany. He later became President of this Society, honorary secretary of the Prehistoric Society of East Anglia and a Fellow of the Geological Society. It is probable that Burrell was Clarke's mentor in Botany.

William Holmes Burrell was 12 years Clarke's senior and was a nationally known Bryologist and a Fellow of the Linnaean Society. He was born in London in 1865, was apprenticed to a chemist in Holt then moved to Kent where he qualified as a pharmaceutical chemist in 1886. He then ran his own pharmaceutical business in Sheringham for 20 years (Porley & Hoggetts 2005). We know that he and Clarke covered much of Norfolk on their bicycles, and it could be suggested that to reach remoter parts of Norfolk, said bicycles must also have travelled by train.

Studying the 1914 Flora edited by WA Nicholson, one discovers that the main preliminary chapter 'Physiography [of Norfolk] and Plant Distribution' was written by Burrell and extends to twenty one pages of lucid description of the various habitats within the county and some of the key spe-

cies to be found in each. Burrell obviously knew Norfolk very well and indeed, while many records in that Flora are initialled 'B&C' (Burrell and Clarke), many others from places quite remote from Sheringham are attributed to 'WHB' (Burrell).

A suggestion had been made in 1908 which had been acted upon and resulted in Clarke reading a paper to the Norfolk and Norwich Naturalists' Society in 1914, describing how the two of them had carried out a vegetation survey of 54 square miles of central Norfolk, with the southern boundary a line running roughly from Ashwellthorpe to Saxlingham Nethergate. This would have been the time when they 'discovered' Flordon Common, resulting in the paper in *Transactions* which the current team have repeated 100 years later. Clarke's major contribution to this region was in his defining of Breckland and his wonderful account of that area of East Anglia in his *In Breckland Wilds*, completed only a few months before his untimely death in 1925 at the age of 48. Burrell on the other hand lived to be 80 (1865-1945) and, according to Trist (1979) he was latterly an active member of the Yorkshire Naturalists Union while living in Leeds.

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AL Bull 'Hillcrest', Main Road, East Tud-denham, Dereham, Norfolk NR20 3JJ

As the following extract corrects some of the assertions in Burrell & Clarke 1910 but is now difficult to come by, it has been included here by kind permission of Geoffrey Kelly. The original study referred to an accompanying list of documents and maps (by letter) and these have been replaced here by references below.

Flordon Common: An Historical and Documentary Account

Researched by Geoffrey Ian Kelly, B.A. (Hons.), M.C.L.I.P.

Commissioned by Ron Robinson

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The use and, indeed, abuse of Flordon Common have been topics of particular local interest for the last thirty five or so years. For many centuries prior to the mid-twentieth, Flordon Common had enjoyed an untroubled existence as an integral part of the parish of Flordon: one upon which certain parishioners had specified rights, and which rights served to complement the rich natural history of the site. Burrell and Clarke (1910) and Clarke (1922) note that it was the copyhold tenants of Sir Kenneth Kemp's Manor (of Flordon) who had the sole right of pasturage and sedge cutting of this Common.

This assertion was incorrect, even in respect of the pre-1922 Law of Property Act period when copyhold still existed as a form of tenure that is alongside the surviving freehold and leasehold forms. First, it is known from the evidence of Glebe Terriers periodic listings of property with which successive Rectors of Flordon were endowed that such Rectors had 'from time immemorial' a right of commonage: and the Flordon Glebe was freehold, not copyhold land.

Second, the Duties on Land Values Schedules of 1910 indicate that Harvey House, then owned and occupied by Mrs. Emma Potter who was a commons rights holder, was freehold property.

(Copyhold, I might explain, was a form of tenure which originated in the late Middle Ages. The name derives from the fact that each time such property changed ownership

through inheritance, sale or mortgage, the transaction was recorded in the Court Books of the Manor by the Lord of the Manor's Steward at the periodic Manor Court, then the latter gave the incoming owner a copy of the entry as his or her right to title hence copyhold.)

The Domesday Book (1086) does not specifically describe Flordon Common; however, such an expanse of mostly damp pasture is almost certain to have existed then and to have been used by the villages as has been customary since. The earliest surviving Glebe Terrier for Flordon, that of 1613, refers to the Common and implies that at an unspecified earlier time it extended further down the valley in which it lies, perhaps as far as the now vanished Flordon Mill (see the Ordnance Survey 6" to 1 mile map 'Flordon Common and its Neighbourhood, surveyed 1880-2). Burrell and Clarke were wrong in stating that this cutting back of the Common to within its existing limits resulted from an Enclosure Act (Burrell & Clarke 1910 pp.170 & 172), the gravel pit by the far north western end of the Common seems never to have formed an integral part of it.

The kind of use to which Flordon Common has been traditionally put would have owed its origin to mutual agreement amongst interested parties. Any changes to the rules which were ever felt desirable would have been made, and fines imposed upon those who broke them, at the periodic Manor Courts. From the reign of Stephen (1135-1154) until 1465, the Lords of the Manor of Flordon under whose aegis these courts were held were members of the Buttevelyn family; while from the latter year, not 1372, as stated by Burrell and Clarke, members of the Kemp family were Lords until 1960. It may well be the case, given the example of Court Books of other Norfolk manors which I have seen, that certain customs or rules relating to the use of Flordon Manor are noted in its Court Books which survive for the period 1625-1919; however, these manuscript volumes were sold with the Lordship by the late Sir Kenneth Kemp's surviving daughters, Violet Mary Kemp and Ida Dorothy Gillam, to Geoffrey Webster of Flordon Hall in 1960.

That Flordon Common had no specific owner(s) as such is clear from both the parish Tithe Apportionment Schedules of 1844 (which complement a map surveyed two years earlier) and the Duties on Land Values Schedules of 1910. An assumption of mine is that once copyhold tenure was abolished shortly after the end of the First World War and there was consequently no further call for Flordon Manor Court to document the conveyance of such property, the Flordon Parish Council assumed by default, as it were, an overall responsibility for the Common. This situation had clearly arisen by 1954 (Eastern Daily Press, 1954), when the authorization of drainage work upon the Common for two parishioners one at least of whom was a Parish Councillor was to lead to protests and, when eventually her rights were further compromised, to legal action by a common rights holder, Mrs. Ida Holmes of Harvey House.

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ORDNANCE SURVEY, Flordon Common and its Neighbourhood 6" to 1 mile map (surveyed 1880-1882).

I.
THE FAUNA AND FLORA OF FLORDON
COMMON.

BY W. H. BURRELL, F.L.S., AND W. G. CLARKE.

Read 27th September 1910.

CHIEFLY owing to improved drainage, a large number of the "wet commons" of Norfolk have become appreciably drier within living memory, and though in some instances it is improbable that this process will be continuous, many things tend to make the wilder portions of the county less wild and inaccessible. Bearing this in mind we thought that a careful study of a particular common at all seasons of the year, while not without interest to present-day naturalists, might, in view of the changes mentioned, have a greater value for our successors as, a record of a typical "wet common" early in the twentieth century. The common selected was that of Flordon, a village $7\frac{1}{2}$ miles south by west of Norwich. In Domesday Book it was described as "Florenduna," and the suggested derivation of the name from the Anglo-Saxon "flor," a plain, and "don," a hill, suitably describes the situation of the village on a southern slope to the alluvium—some of which forms the common—by the side of a small brook which rises at Hethel; has a course of $1\frac{3}{4}$ mile before reaching the common, borders it (with one break) for over half a mile, and in a further two-thirds of a mile falls into the Tas after passing Flordon Mill. The common, which is in latitude $52^{\circ} 32'$ and longitude $1^{\circ} 13' E.$, lies west of the main part of the village and the church, on the north side of the brook, its narrowest part being 100 feet wide, and its widest part (bordering the road to Hapton) 1100 feet. The area of the common is 33a. 1r. 17p., awarded under an Enclosure Act of which no local copy exists, and the copyhold tenants of Sir Kenneth Kemp's manor—held by the Kemps since 1372—have the sole right of pasturage and sedge-cutting. Until the Enclosure Act the common extended eastward to the Tas. The road from Flordon to Hapton divides the common into two parts, that to the east being much the larger. This portion consists roughly of three areas : one of coarse pasturage on the north-east, a narrow strip of land a few feet above the alluvium on the north, and the remainder marsh, averaging about 80 feet above O.D.

The western portion consists of a small piece of marsh and a long narrow strip of higher land, having at the north-west the parish pit, between which and the stream are remains of old workings for gravel and chalk. The higher land on the eastern part of the common consists of Crag gravel

gradually rising towards the pit which is cut in the side of a small hill. In the base of the pit a smaller excavation for chalk (upper) showed a few flints and one specimen of *Belemnitella mucronata*, Schlt. On the chalk is the "stone-bed" of the Norwich Crag, about 1¼ feet in thickness, consisting of angular and sub-angular flints in a kind of "iron pan," and yielding a fair proportion of pre-Palaeolithic flint implements (first noted in October, 1908) of the same types as those found in a similar bed at Eaton, Earlham, Heigham, Little Hautbois, Swannington, Bramerton, Whitlingham (beneath undisturbed shelly Crag) and Tharston. The implements are of several different types and patinations, and some are extremely well worked. Above the "stone-bed" there are, firstly, about 16 feet of red, brown and white sand, and shingle almost entirely made up of flint pebbles ; secondly, from one to five feet of false-bedded red sand and gravel with a few flint and many quartz pebbles, both belonging to the Upper Crag series.¹ Above this is a stony loam varying much in thickness, from which a scraper of fine workmanship found on the talus, was apparently derived, and at the north-west corner there are patches of chalky boulder clay, one being three feet in diameter. In the surface soil a few Neolithic flint implements have been found.

The valley in which the marshy part of the common lies is about three-fourths of a mile wide from ridge to ridge, with an average depth of about 60 feet. It is probably due to glacial action, for it seems impossible that so short a stream could ever have cut away so much of the adjoining hills, and left so wide a stretch of alluvium. There are six springs on the common, one on the middle of the eastern portion which flows by a ditch to the stream; one near the house; three others close together in the western portion, only a few feet from the ditch, and virtually on the same level; while the sixth and most powerful is below the parish pit, and flows westward to the stream.

By digging nine sections in different parts of the Common it was possible to obtain a fairly accurate knowledge of the constitution of the subsoil. In a hillock on the higher ground of the eastern common there were three feet of made soil containing two Neolithic flint implements, but a section at the bottom of a hollow a few yards away showed gravel (as in the pit) immediately beneath the turf. On one of the small hillocks in the marsh but close to the high ground there were a few flints in the 15 inches of surface soil, and beneath that undoubted chalky boulder clay full of flints. In another hillock there was one foot of surface soil, then calcareous soil containing land and fresh-water shells, the water-level being 15 inches from the surface. One of the low-lying places in the marsh showed 22 inches of black surface soil, then calcareous matter with plant-remains and land and fresh-water shells, the water-level being 24 inches from the surface. One of the raised areas quite in the middle of the marsh gave a

¹ H. B. Woodward's 'Geology of the Country around Norwich,' p. 70.

most instructive section. Beneath four inches of black soil (brown when dry) there was one foot of brown calcareous soil and two feet of white, the whole section showing rootlets, plant remains, abundant fragments of *Limnaea*, *Planorbis*, *Vertigo*, and *Valvata*, and *Chara* fruits, probably of the two species still found on the common, as they show 10 and 13 spires. A cutting in a shallow depression at the end of a small pool showed 10 inches of surface soil, then very white calcareous soil six inches thick, and beneath that brown, with shells and much vegetable matter. The alluvium of the western common gave three feet of surface soil without the characteristic calcareous matter. The subsoil of the marsh under a very compact herbage, is generally firm, but in a few places a pole penetrated four feet of ooze, as it did in the channel of the old ditch.

Analyses of five examples of the calcareous soil found by excavation in the marsh gave the following results:

	A	B	C	D	E
Soluble in dilute Hydrochloric Acid	.843	.732	.897	.637	.789
Combustible	.141	.252	.091	.312	.180
Ash insoluble in dilute Hydrochloric Acid	.016	.016	.011	.025	.031

These figures show that in the five samples an average of 78 per cent. was soluble in dilute hydrochloric acid, 20 per cent. was combustible, and there was a residue of 2 per cent. insoluble, the first indicating the soluble alkalies and alkaline earths, the second the carbonaceous matter, and the third insoluble ash containing silt, and compounds of silica, sulphur, iron and phosphorus from the plant debris. An examination of the figures, with the entire absence of stones, appears to indicate that the subsoil is the product of vegetable decomposition, and the action of living organisms on calcareous water. The small proportion of insoluble ash shows that alluvial matter is not brought in any quantity by flood-water from higher levels, yet the accumulation of ooze is visible in the deposit of calcium salts on vegetation in the pools. Tests of the hardness of the water made by soap soloids gave three to four degrees of hardness from springs, pools and stream, compared with an average of 12 to 20 degrees in Norfolk waters. It is therefore obvious that plants can utilise infinitesimal quantities of salt in solution, a fact of which Kerner gives some striking examples. The very low ash values of samples A and B may be due to the absence of introduced sand or clay, but is compatible with the theory that this white earth was formed in a pool occupied by *Chara*, the fruits being very abundant, and the debris of which would contribute much lime and little silica, the ash yielding 54.8 and 0.3 per cent. respectively (Kerner). The brown deposits D and E, with a larger proportion of ash, may have been built up by a sedge type of vegetation, whose stems

yield an ash containing 50 to 70 per cent. of silica. In both cases the bulk of lime is not contributed by the decaying vegetable matter, but is precipitated from the calcareous water by aquatic vegetation, a process that is always in operation in sunlight. Some portion of the ash is of non-organic origin, but microscopic examination shows that a considerable portion of insoluble matter consists of plant skeletons. The high ash value of E is due to grit, which visibly contributes to the 310 millegrams by weight obtained, a fragment of brick-like substance and 10 quartz grains picked out with forceps weighing 20 millegrams.

Of changes on the common we have very little evidence. Mrs. Potter has lived all her life at the cottage adjoining the common on the north, and her father came to live there in 1813, so that the family traditions cover almost a century. She says that the common is very much drier now than when she was a girl. Much of the marshy portion was then impassable, and in many places a rake could be put into the water without the bottom being touched. The low portion of the common was formerly intersected with drains, now grown up, though distinguishable at certain seasons of the year. Of changes (if any) in the flora we have no record. On August 17th, 1885, Mr. H. D. Geldart and Mr. H. G. Glasspoole visited the common, and all the twenty plants they noted² were (with the exception of *Sparganium neglectum*) found there by us in 1909.³

Economically the common appears to be of no great value. Horses, cattle, geese, hens, ducks and turkeys feed upon it; a small portion of the western common yields good hay; several areas of sedge and rush are cut for litter, furze for fuel, and ash and hazel from the hedges for incidental uses; while watercress is gathered from the stream, and from the ditch fed by the springs.

The mammals noted were naturally few, comprising moles, common field-voles, water-voles, hares and rabbits. Common lizards, newts, frogs, and toads also occur. Frog spawn is very abundant in the early spring, and in April, 1909, we measured one solid mass in the northern ditch 3 ft. 8 in. long by 2 ft. 7 in. broad.

The bird-life of the common is not particularly varied. Forty-seven species of birds were noted at various times, and the nests or young of 19 species. Of those not nesting the only ones worthy of note are the herons and woodcock. The nesting species are the mistle-thrush, song-thrush, black-bird, robin, lesser whitethroat, hedge-sparrow, long-tailed titmouse, wren, meadow-pipit, sand-martin, goldfinch and chaffinch. Probably the most common nesting-bird on the marsh was the reed bunting (*Emberiza schoeniculus*, Linn.), though the nests are not easily found. Those noted

² Trans. Norfolk and Norwich Nat. Soc. vol. iv. p. 258.

³ In the "Diatomaceae of Norfolk" (Ibid. ii. 336, iii. 754). Mr. F.G. Kitton records many from Flordon.

were chiefly beneath the shelter of the dead leaves of *Carex paniculata*, though one was built in the middle of a tuft quite open to the sky, and another in a clump of *Juncus effusus*. Other nesting-birds were the kingfisher, pheasant, common partridge, moorhen, coot, lapwing, and common snipe.

Our list of mollusca is certainly not exhaustive, as the species were identified by Mr. A. Mayfield, M.C.S., from a small quantity of marsh soil sent to him from a mole-hill. The land species were *Punctum pygmaeum* (Draparnand), *Hygromia sericea* (Drap.), *Vallonia pulchella* (Müller), *Cochlicopa rubrica* (Müller), *Jaminia muscorum* (Linné), *Vertigo antivertigo* (Drap.), *Vertigo pygmaea* (Drap.), *Vertigo angustior* (Jeffreys), *Succinea elegans* (Risso) and *Carychium minimum* (Müller), and the aquatic species *Limnaea pereger* (Müller), *Limnaea truncatula* (Müller), *Planorbis vortex* (L.) and *Valvata cristata* (Müller). *Helix nemoralis* (L.) was also noted among the hedgeside vegetation, *Helix caperata* in the pit, *Anion ater* (Linné) with one specimen subrufous on the marsh, and *Pisidium pulchellum* (Jenyn) in a pond at the west end of the common. *Vertigo angustior* had only been found once previously in Norfolk, and that was by Mr. Mayfield on Roydon Fen. *Limnaea stagnalis* and *Limnaea pereger* are very abundant in the pools on the marsh.

For the purpose of obtaining a general idea of the flora of the common. for two years we visited it from early spring to late autumn, identifying the various plants, noting their habitat, and, so far as was possible, their distribution. The plant associations of the common may reasonably be divided into three: (1) that of the water, (2) that of the marsh, and (3) that of the long narrow strip of ground a few feet above the marsh-level, and of the parish pit.

PLANTS OF THE WATER.

The water area includes the stream which runs on the south side of the common. On the eastern portion there is very little vegetation either in the stream or at the sides, the water running swiftly in short reaches on a gravelly bottom, with *Zannichellia palustris* in a few places. At each turn the water gradually undermines one bank and silts up the opposite side, so that although perpetually changing its course it never gets wider. The more westerly portion of the western common is likewise bounded by the brook which tinkles as it flows over its stony bed in a manner reminiscent of the Yorkshire dales rather than of Norfolk. Overhanging the water almost at the western boundary is a willow on which grow specimens of *Polypodium vulgare*, *Ribes grossularia*, and *Rubus rusticanus*. Part of the northern boundary of the eastern common is a ditch containing a considerable amount of water early in the year, but partly dry in September. *Hottonia palustris* is here plentiful. On the marsh of this part of the com-

mon there are also ditches and scores of pools, mostly of small size, and containing *Chara*, but a few of the larger ones have an abundance of *Utricularia vulgaris* and *U. minor*.⁴ On the western common there is a ditch full of rank vegetation in summer. Among specimens of *Apium nodiflorum*, *Sium erectum*, *Sparganium erectum*, *Lemna minor*, *Glyceria fluitans* and *Glyceria aquatica*, float thousands of plants of *Ricciocarpus natans*. This interesting hepatic was recorded from Heydon by Mr. Bryant in the 18th century, and from Sutton by Mr. W. A. Nicholson in 1906. At Flordon it was noted in the autumn of 1908, and since then has been found at Booton, Weston, and Little Melton, where in 1909, 300 square yards of water in two clay pits were closely covered with it. The Census Catalogue of British Hepatics (1905) records it for 8 vice-counties out of Watson's 112, and 6 Irish vice-counties. Macvicar does not record it for Scotland.

The aquatic species noted were :—

<i>Ranunculus trichophyllus</i> ⁵		<i>Alisma ranunculoides</i>
<i>Radicula Nasturtium-aquaticum</i>		<i>Potamogeton natans</i>
<i>Cardamine amara</i>		<i>Zanichellia palustris</i>
<i>Callitriche stagnalis</i>		<i>Phragmites communis</i>
<i>Apium nodiflorum</i>		<i>Glyceria fluitans</i>
<i>Sium erectum</i>		- <i>aquatica</i>
<i>Oenanthe fistulosa</i>		<i>Equisetum limosum</i>
<i>Hottonia palustris</i>		<i>Chara hispida</i>
<i>Veronica Anagallis-aquatica</i>		- <i>vulgaris</i>
- <i>Beccabunga</i>		
<i>Utricularia vulgaris</i>		<i>Hypnum aduncum</i> var. <i>aquaticum</i>
- <i>minor</i>		- - - var. <i>polycarpon</i>
<i>Sparganium erectum</i>		- <i>scorpioides</i>
<i>Lemna minor</i>		- <i>giganteum</i>
<i>Alisma Plantago-aquatica</i>		<i>Ricciocarpus natans</i>

PLANTS OF THE MARSH.

The largest and most interesting part of Flordon Common is undoubtedly the marsh, in which we have included an area of rough pasturage at the north-eastern end, as well as that where *Carex-Juncus* is dominant. The latter includes a small triangle on the western common. In the winter this part is tawny of aspect, becoming green in the spring, brownish-purple at the end of May, brown at the end of June, and gradually changing to tawny. This colouring is mainly due to species of *Juncus*—*Juncus subnodulosus* appears to be the dominant plant—and *Carex*, with *Schoenus nigricans*

⁴ The illustrations on Plate 29 of Vol. ii. of 'Wild Flowers of the British Isles,' by H. Isabel Adams, F.L.S. and J. E. Bagnall, A.L.S. are from Flordon specimens.

⁵ The nomenclature adopted is that of the 'London Catalogue of British Plants,' 10th edition (1908).

also very abundant. Apart from these, during the spring and summer months, various flowering plants appear successively to preponderate, *Cardamine pratensis*, being followed in succession by *Valeriana dioica*, *Orchis latifolia*, *Eriophorum angustifolium*, *Pinguicula vulgaris*, *Helleborine longifolia*, *Drosera anglica*, *Pedicularis palustris*, *Parnassia palustris* and *Scabiosa Succisa*, with *Potentilla procumbens* as perhaps the most widely distributed plant in flower throughout the summer months. *Drosera anglica* is the only sundew that occurs, *rotundifolia* appearing to need a peaty soil. The local name for the sundew at Flordon is the “murder-plant,” and particularly in August we noted many moths and butterflies caught thereon, a green-veined white butterfly fluttering from one leaf to another until the sixth permanently imprisoned it by the tip of one wing. There appears to be practically no grass growing on the marsh, save a few small areas of *Molinia coerulea*, the foundation of the marsh floor being moss, principally *Hypnum cuspidatum* and *Hypnum molluscum*. There are also a number of small hillocks, a foot or two higher than the bulk of the marsh, and of course considerably drier. On some of these there are closely-cropped portions consisting chiefly of sedges, *hirta* and *glauca*, the few grasses present being *Holcus lanatus*, *Briza media* and *Fesluca ovina*. To these hillocks *Ophioglossum vulgatum* is apparently confined, while they also abound in *Polygala vulgaris* and *Plantago media*. Though the species found on the marsh are not numerous, for it offers little variation of habitat, the number of individual plants of certain species is amazing, especially of those mentioned as dominant. To these may be added the four *Ranunculi*, *Lychnis Flos-cuculi*, *Hydrocotyle vulgaris*, *Galium palustre*, *G. uliginosum*, *Menyanthes trifoliata*, *Juncus inflexus*, *J. sylvaticus*, *Carex pulicaris*, *C. Goodenowii*, *C. flacca*, *C. flava*, and *C. hirta*.

Three bryophytes found on the marsh are specially noteworthy. *Splachnum ampullaceum* recorded from numerous localities in the older lists is now rare in the Eastern Counties; this is the only recent record for Norfolk. A liverwort belonging to the genus *Mörckia*—probably *Mörckia Flotowiana*—was detected in 1909, and has since been seen at Whitwell and Blo’ Norton. In Britain this species is almost confined to damp, sandy ground near the sea. As our marsh plant differs in habit from the tufted growth of the coastal sand dunes, it seems advisable to keep it under observation until mature spores are available. A liverwort belonging to the *Mülleri* group of the genus *Lophozia* was at first assumed to be *Lophozia Mülleri* but doubt having arisen, it was sent to Professor Schiffner of Vienna, who detected the paroicous inflorescence and placed it under *Lophozia Schultzii*, as a new variety, for which he proposed the varietal name “*laxa*.” The type occurs from Brandenburg—approximately in the same parallel of latitude as Norfolk—northwards to near the Arctic Circle in Lapland, Siberia, and Yukon; it has been seen most frequently in Scandinavia, but has not been recorded for the British Isles.

Although no attempt has been made to deal with the fungus flora of the common, a passing reference may be made to a species of Mycetozoa not previously recorded for Britain. It was identified by Miss Lister as *Chondrioderma asteroides*, first found in the South of France on fir-needles, &c., in 1902⁶ and since recorded from Portugal, North Germany and Colorado on fir-needles, Eucalyptus, Alder twigs and wood. At Flordon the sporangia had matured on *Equisetum palustre*.

The following were the species noted on the marsh:-

<i>Ranunculus Flammula</i>	<i>Valeriana officinalis</i>
- <i>acris</i>	<i>Scabiosa Succisa</i>
- <i>repens</i>	- <i>arvensis</i>
- <i>bulbosus</i>	<i>Eupatorium cannabinum</i>
<i>Caltha palustris</i>	<i>Pulicaria dysenterica</i>
<i>Cardamine pratensis</i>	<i>Chrysanthemum Leucanthemum</i>
<i>Erysimum cheiranthoides</i>	<i>Senecio erucifolius</i>
<i>Polygala vulgaris</i>	- <i>Jacobaea</i>
<i>Lychnis Flos-cuculi</i>	- <i>aquaticus</i>
<i>Stellaria aquatica</i>	<i>Cnicus palustris</i>
- <i>uliginosa</i>	<i>Hypochaeris radicata</i>
<i>Arenaria trinervia</i>	<i>Leontodon hispidum</i>
<i>Sagina nodosa</i>	- <i>autumnale</i>
<i>Hypericum quadrangulum</i>	<i>Anagallis tenella</i>
<i>Linum catharticum</i>	<i>Menyanthes trifoliata</i>
<i>Lotus uliginosus</i>	<i>Myosotis scorpioides</i>
<i>Vicia Cracca</i>	<i>Scrophularia aquatica</i>
<i>Lathyrus pratensis</i>	<i>Euphrasia officinalis</i>
<i>Spiraea Ulmaria</i>	<i>Bartsia Odontites</i>
<i>Geum rivale</i>	<i>Pedicularis palustris</i>
<i>Potentilla procumbens</i>	- <i>sylvatica</i>
- <i>argentea</i>	<i>Pinguicula vulgaris</i>
<i>Parnassia palustris</i>	<i>Mentha aquatica var. hirsuta</i>
<i>Drosera anglica</i>	<i>Lycopus europaeus</i>
<i>Lythrum Salicaria</i>	<i>Scutellaria galericulata</i>
<i>Epilobium hirsutum</i>	<i>Prunella vulgaris</i>
- <i>parviflorum</i>	<i>Plantago lanceolata</i>
- <i>montanum</i>	<i>Atriplex hastata</i>
- <i>palustre</i>	<i>Polygonum Persicaria</i>
<i>Hydrocotyle vulgaris</i>	<i>Rumex Acetosa</i>
<i>Angelica sylvestris</i>	<i>Quercus Robur (seedlings)</i>
<i>Galium palustre</i>	<i>Listera ovata</i>
- <i>uliginosum</i>	<i>Helleborine longifolia</i>
<i>Valeriana dioica</i>	<i>Orchis incarnata</i>

⁶ Journ. of Bot. 1902, p. 209.

<i>Orchis latifolia</i>	<i>Fissidens adiantoides</i>
- <i>maculata</i>	<i>Splachnum ampullaceum</i>
<i>Habenaria conopsea</i>	(coprophilus)
<i>Iris Pseudacorus</i>	<i>Philonotis fontana</i>
<i>Juncus bufonius</i>	- <i>calcareo</i>
- <i>inflexus</i>	<i>Bryum pseudo-triquetrum</i>
- <i>effusus</i>	- <i>bimum</i>
- <i>subnodulosus</i>	<i>Brachythecium rutabulum</i>
- <i>sylvaticus</i>	<i>Amblystegium filicinum</i>
<i>Triglochin palustre</i>	<i>Hypnum elodes</i>
<i>Eriophorum angustifolium</i>	- <i>stellatum</i>
<i>Schoenus nigricans</i>	- <i>Sendtneri</i>
<i>Carex pulicaris</i>	- <i>revolvens</i>
- <i>paniculata</i>	- <i>intermedium</i>
- <i>ulpina</i>	- <i>commutatum</i>
- <i>echinata</i>	- <i>molluscum</i>
- <i>Goodenowii</i>	- <i>scorpioides</i>
- <i>flacca</i>	- <i>giganteum</i>
- <i>panicea</i>	- <i>cuspidatum</i>
- <i>flava</i>	<i>Mnium affine</i>
- <i>hirta</i>	<i>Climacium dendroides</i>
- <i>Pseudo-Cyperus</i>	<i>Brachythecium glareosum</i>
- <i>inflata</i>	<i>Aneura incurvata</i>
<i>Phalaris arundinacea</i>	- <i>multifida</i>
<i>Molinia coerulea</i>	<i>Mörckia Flotowiana</i>
<i>Briza media</i>	<i>Lophozia Schultzii (Nees)</i>
<i>Ophioglossum vulgatum</i>	<i>Schiffner</i> var. nov. <i>laxa</i>
<i>Equisetum arvense</i>	<i>Plagiochila asplenioides</i>
- <i>palustre</i>	<i>Chiloscyphus polyanthos</i>
- - var. <i>polystachyum</i>	<i>Pellia endiviaefolia</i>
<i>Equisetum limosum</i>	

PLANTS OF THE HIGHER GROUND.

By far the larger number of species is to be found on the higher ground, owing to its much greater diversity. It includes (a) on the eastern common the northern and western boundary hedges, and on the western common the northern and eastern and one intermediate; (b) on the eastern common a short length of dry ditch; (c) a small clay area from which a spring oozes; (d) a long narrow belt of gravelly soil sloping down to the marsh; with (e) a steeply sloping bank facing south. On the western common this (f) narrow ridge of gravelly soil becomes much higher and has thickets of furze on its southern slope. Beyond a big hedge running north and south

the roadway enters (*g*) an area of hills and hollows, probably the result of ancient parochial workings for chalk and gravel, opening on the north to (*h*) the parish gravel pit at present in use. With these varying soils and surroundings it is obvious that a large number of species find suitable environment. Both on *f* and *g* there are large brakes of *Rubus idaeus* and among the furze on the former are *Senecio sylvaticus*, *Campanula rotundifolia*, *Linaria vulgaris*, *Clinopodium vulgare* and *Galeopsis Tetrahit*. By the foot-path to Wreningham on the western boundary of the common is an elder tree 4 ft. 1 in. in circumference 3½ ft. from the ground, and about 30 ft. in height.

The following were the plants noted on the higher ground:-

<i>Ranunculus acris</i>	<i>Tilia vulgaris</i>
- <i>repens</i>	<i>Linum catharticum</i>
- <i>bulbosus</i>	<i>Geranium molle</i>
- <i>Ficaria</i>	- <i>dissectum</i>
<i>Papaver Rhoeas</i>	- <i>Robertianum</i>
<i>Chelidonium majus</i>	<i>Erodium cicutarium</i>
<i>Fumaria officinalis</i>	<i>Acer Pseudo-platanus</i>
<i>Cardamine hirsuta</i>	- <i>campestre</i>
<i>Erophila verna</i>	<i>Ulex europeus</i>
<i>Sisymbrium Thalianum</i>	<i>Ononis spinosa</i>
- <i>officinale</i>	<i>Medicago lupulina</i>
- <i>Alliaria</i>	<i>Trifolium pratense</i>
<i>Brassica arvensis</i>	- <i>arvensis</i>
<i>Capsella Bursa-pastoris</i>	- <i>repens</i>
<i>Reseda Luteola</i>	- <i>procumbens</i>
<i>Viola arvensis</i>	- <i>dubium</i>
<i>Silene latifolia</i>	- <i>filiforme</i>
<i>Lychnis alba</i>	<i>Lotus corniculatus</i>
- <i>dioica</i>	- <i>uliginosus</i>
<i>Cerastium viscosum</i>	<i>Vicia hirsuta</i>
- <i>vulgatum</i>	- <i>Cracca</i>
<i>Stellaria media</i>	- <i>sepium</i>
- <i>Holostea</i>	- <i>sativa</i>
- <i>graminea</i>	<i>Prunus spinosa</i>
- <i>uliginosa</i>	- <i>avium</i>
<i>Arenaria trinervia</i>	<i>Rubus idaeus</i>
- <i>serpyllifolia</i>	- <i>rusticanus</i>
<i>Sagina procumbens</i>	- <i>corylifolius</i>
<i>Montia fontana</i>	<i>Geum urbanum</i>
<i>Hypericum perforatum</i>	<i>Fragaria vesca</i>
- <i>pulchrum</i>	<i>Potentilla sterilis</i>
<i>Malva sylvestris</i>	- <i>erecta</i>
- <i>rotundifolia</i>	- <i>reptans</i>

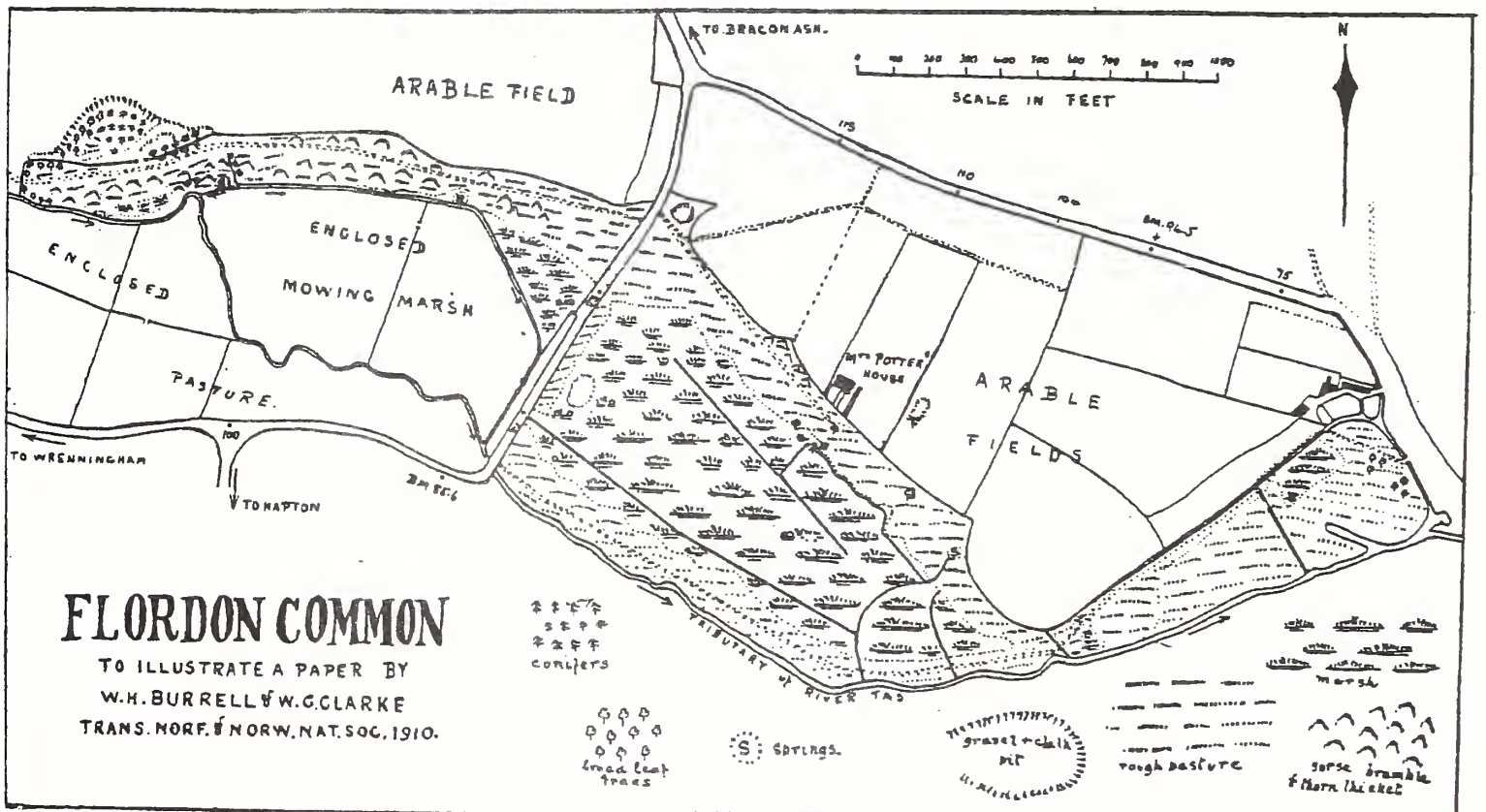
- *anserina*
 - *argentea*
Alchemilla arvensis
Agrimonia Eupatoria
Rosa Eglantheria
 - *canina*
Pyrus Malus
Crataegus Oxyacantha
Saxifraga granulata
Ribes Grossularia
Bryonia dioica
Conium maculatum
Anthriscus vulgaris
 - *sylvestris*
Heracleum Sphondylium
Daucus Carota
Caucalis Anthriscus
Hedera Helix
Cornus sanguinea
Adoxa Moschatellina
Sambucus nigra
Viburnum Opulus
Lonicera Periclymenum
Galium verum
 - *palustre*
 - *Aparine*
Sherardia arvensis
Scabiosa arvensis
Bellis perennis
Filago germanica
Achillea Millefolium
Chrysanthemum Leucanthemum
Matricaria inodora
Artemisia vulgaris
Senecio vulgaris
 - *sylvaticus*
 - *erucifolius*
 - *Jacobaea*
Carduus nutans
Cnicus lanceolatus
 - *acaulis*
 - *arvensis*
Onopordum Acanthium
Centaurea nigra

Centaurea Scabiosa
Cichorium Intybus
Crepis capillaris
Hieracium Pilosella
Hypochoeris radicata
Leontodon hispidum
Taraxacum officinale
Sonchus oleraceus
Campanula rotundifolia
Legousia hybrida
Primula vulgaris
 - *veris*
Anagallis arvensis
Fraxinus excelsior
Ligustrum vulgare
Centaureum umbellatum
Myosotis arvensis
 - *collina*
 - *versicolor*
Convolvulus arvensis
Solanum Dulcamara
Verbascum Thapsus
Linaria vulgaris
Veronica agrestis
 - *arvensis*
 - *serpyllifolia*
 - *Chamaedrys*
Euphrasia officinalis
Orobanche minor
Verbena officinalis
Mentha longifolia
Thymus Serpyllum
Clinopodium vulgare
Calamintha Acinos
Salvia Verbenaca
Nepeta Cataria
 - *hederacea*
Prunella vulgaris
Stachys sylvatica
Galeopsis Tetrahit
Lamium purpureum
 - *album*
Ballota nigra
Plantago major

<i>Plantago media</i>	<i>Agrostis tenuis</i>
- <i>lanceolata</i>	<i>Deschampsia caespitosa</i>
- <i>Coronopus</i>	<i>Holcus lanatus</i>
<i>Scleranthus annuus</i>	<i>Trisetum flavescens</i>
<i>Chenopodium album</i>	<i>Arrhenatherum elatius</i>
- <i>Bonus-Henricus</i>	<i>Cynosurus cristatus</i>
<i>Atriplex patula</i> , var. <i>angustifolia</i>	<i>Dactylis glomerata</i>
<i>Polygonum Convolvulus</i>	<i>Poa annua</i>
- <i>aviculare</i>	- <i>pratensis</i>
<i>Rumex conglomeratus</i>	<i>Festuca rigida</i>
- <i>pulcher</i>	- <i>ovina</i>
- <i>obtusifolius</i>	- <i>elatior</i>
- <i>crispus</i>	<i>Bromus sterilis</i>
- <i>Acetosa</i>	- <i>arvensis</i>
- <i>Acetosella</i>	<i>Lolium perenne</i>
<i>Mercurialis perennis</i>	<i>Agropyron repens</i>
<i>Ulmus campestris</i>	<i>Hordeum nodosum</i>
<i>Humulus Lupulus</i>	<i>Pteris aquilina</i>
<i>Urtica dioica</i>	<i>Lastrea Filix-mas</i>
<i>Alnus rotundifolia</i>	<i>Polypodium vulgare</i>
<i>Corylus Avellana</i>	
<i>Quercus Robur</i>	<i>Ceratodon purpureus</i>
<i>Castanea sativa</i>	<i>Dicranella varia</i>
<i>Salix alba</i>	<i>Grimmia pulvinata</i>
- <i>viminalis</i>	<i>Tortula laevipila</i>
- <i>caprea</i>	<i>Barbula convoluta</i>
<i>Populus alba</i>	<i>Orthotrichum affine</i>
<i>Orchis mascula</i>	- <i>diaphanum</i>
<i>Ophrys apifera</i>	<i>Bryum capillare</i>
<i>Tamus communis</i>	- <i>argenteum</i>
<i>Allium ursinum</i>	<i>Amblystegium serpens</i>
<i>Luzula campestris</i>	<i>Camptothecium sericeum</i>
<i>Arum maculatum</i>	<i>Hylocomium triquetrum</i>
<i>Carex muricata</i>	<i>Lophocolea bidentata</i>
<i>Anthoxanthum odoratum</i>	<i>Lunularia cruciata</i>
<i>Alopecurus geniculatus</i>	<i>Leucodon sciuroides</i>
<i>Phleum pratense</i>	

Of the flowering plants and ferns 25 were noted in the water area, 98 in the marsh and 211 on the higher ground, while the mosses and hepatics in the same areas numbered respectively 5, 28 and 15. Allowing for 15 species which are noted as occurring both on the marsh and the higher ground, it will be found that the number of the former was 319 and of the latter 48, a total of 367 species.

Taking the marsh and water area only, the number of flowering plants was 123. It is interesting to compare this with the area preserved as far as possible in its primitive state, and known as Wicken Fen. In his 'Flora of Cambridgeshire' (1860), Professor Babington gave a list of plants recently found there. From this it appears that 125 species had been found at Wicken, of which we have noted 61 on Flordon Common. At Wicken it may be interesting to observe that the plant which forms the great mass of the herbage is *Cladium Mariscus*, and those which most abound are *Thalictrum flavum*, *Viola stagnina*, *Peucedanum palustre*, *Valeriana dioica*, *Cnicus pratensis*, *Orchis incarnata*, *Iris Pseudacorus*, *Luzula multiflora*, *Schoenus nigricans*, *Agrostis canina*, and *Lastrea Thelypteris*. Of these only *Valeriana*, *Orchis*, *Iris* and *Schoenus* occur at Flordon.



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Landscape with trees

Norfolk's trees, woodlands and orchards – aspects of landscape history and biodiversity

Gerry Barnes

Introduction

I have called this paper *Landscape with Trees: Norfolk's Trees, Woodlands and Orchards – Aspects of Landscape History and Biodiversity*. I am essentially someone interested in our woody landscape, be it trees, woods, hedges or orchards. I am also interested in the landscape history of our County, and this paper seeks to shed light on some recent research into that history that has been undertaken at the University of East Anglia, and to propose how we might use this knowledge to further the aims of conserving our biodiversity.

Orchards

The value of orchards for biodiversity has long been neglected, this situation changing only relatively recently. Of all the statistics on habitat loss, one of the most depressing relates to orchards. For example, Wiltshire has lost 95% of its orchards since 1945, Devon, 90%, and Somerset 60%, and in Norfolk over 50% of our orchards were lost between 1995 and 2005. Losses are due to pressures from development, the low price of imported fruit and agricultural intensification.

We tend to think of orchards in Norfolk as being largely composed of apple trees. However, in 17th and 18th century Norfolk (and presumably earlier), the proportion of pears grown in orchards was surprisingly high. In sources dated between 1600 and 1799 the proportion of pears in domestic orchards was 12% and in estate and commercial orchards up to 50%. It is likely that many of the varieties grown were used for

drying, baking and stewing – an important source of carbohydrate through the winter months. Plums were also quite commonly grown and, particularly in east and south Norfolk, cherries were also important. Cherries tended to be grown in a separate cherry ground – for example a lease for land in Shelfanger from 1695 describes the Cherryground moate (NRO MC 257/6, 683 x3).

Walnuts and filberts were also grown. Walnuts were often described as growing in meadows, and were also frequently planted on one or more sides of an orchard as shelter. Pears were also planted on the north side of orchards, originally because on wild pear root stocks they were huge. Filberts were grown in most parts of Norfolk, with the exception of the fens, being prized for their superior nut size compared to that of hedge hazels.

Small domestic orchards existed throughout Norfolk until the mid-twentieth century - they were valuable and close to home where they could be protected. These orchards were often attached to quite small cottages or were part of a parcel of small land holdings, perhaps 5-10 acres in total, suggesting that these were small holdings that marketed their crops in the local market. They grew a wide range of varieties and crops, and the fruit they supplied was marketable from July to the following May.

In addition to these domestic orchards was the phenomenal expansion of commercial orchards, in the nineteenth century in the fens and more generally in Norfolk in

the early twentieth century. The area of orchards in Norfolk rose from 6345 acres in 1914 to 8414 acres in 1926 and to 10,089 acres in 1936. The fen orchards – capitalising on the coming of the railways – grew mostly cooking apples and plums, which were sent to the north of England or used locally for jams. In north-east Norfolk the industry developed a little later (utilising eating apples), with the Cubits of Honing and the Petres of Westwick planting the first commercial orchards in the area in 1898.

Orchards are important for biodiversity. They are a specialised form of wood pasture and the trees age quickly providing dead-wood and other niches. Of particular interest is the growing evidence of the value of orchards for bryophytes. One aspect of the conservation of orchards that has received particular attention in the past ten years has been the conservation of ‘Norfolk’ varieties of fruit and numerous orchards with local varieties have been planted in recent years. But, whilst the conservation of as wide a range of genotypes is important we should not be bound by such a slavish approach: of the apple varieties recorded from Norfolk sources as having been planted between 1660 and 1906, only 4% are listed as ‘local’ varieties by the East of England Apples and Orchards Project and less than 1% of the pears are listed. Indeed, many of these so-called traditional varieties are quite recent – well over 50% developed since 1880. A further aspect to recent planting has been an obsession with size-controlling root stocks, notably MM106 – on the basis that MM106 is the ‘traditional’ root stock for Norfolk apples. Yet MM106 was only released on to the market in the early 1930s. When planting orchards we need to think about habitat creation in a mosaic of other habitats rather than being tied to perceived (and, in fact, often recent) traditions.

Enclosed woodlands

Details about Norfolk’s Ancient Woodlands have been provided by a previous President

of this Society – Oliver Rackham. However, a brief resumé is appropriate here. The earliest evidence for the location of woodland, apart from pollen analysis and other fossil records, is from place names. Place names throw light on the appearance of the Saxon countryside, although even this is fraught with difficulty. Nevertheless, general patterns in the distribution of place names show in broad terms the distribution of woodland in middle/late Saxon times. Much of this woodland would, however, have been wood pasture rather than the enclosed woodland we are familiar with in the surviving Ancient Woodlands of Norfolk. Plotted, the distribution of woodland-related names clearly shows a wooded crescent across Norfolk, but there are also interesting outliers – clusters of woodland place names in Broadland and in south west Norfolk around the Wolds of Hockwold, Northwold, and Methwold (*wold* or *wald* being Old English for woodland). These clusters suggest significant areas of wood pasture which had been cleared by 1086.

The Domesday Book recorded woodland in terms of ‘pannage’ – the number of swine the woodland could notionally support. Again the distribution of Norfolk woodland in Domesday shows the wooded crescent, with many of the woodlands lying on parish or hundred boundaries. I have postulated elsewhere that Domesday was only recording wood pasture. In the late 11th century and the 12th century, as the population grew, woods began to be enclosed in order to enable more intensive management. This left the remaining wood pastures to become wooded commons or deer parks.

The extent of common land is difficult to appreciate from a 21st century perspective, because huge acreages were lost in the post medieval period, especially the early 19th century, as a result of parliamentary enclosure. Like the coppice woods of medieval Norfolk, wooded commons had developed directly from the undifferentiated wastes

of the Saxon period, but because they were subject to grazing they became characterised by pollards rather than coppice. Sustained grazing pressures ensued that most commons steadily degenerated into open pasture. The best documented example of a wood pasture becoming an open common in this way is Mousehold Heath. Both commons and enclosed Ancient Woodland have a strong relationship to administrative boundaries, both hundred and parish boundaries.

Changes in the management of enclosed woodland during the last millennia are worth briefly noting. To generalise: when first enclosed woodland would have been cut on a short rotation and there would have been no more than about seven standards per acre. By the 18th century coppice cycles were much longer and, more significantly, there were far more standards – up to 40 per acre. This resulted in heavy shading and thus surveyors were recording in the tithe files that the coppice was being damaged by shading (e.g. “much injured by the timber”; PRO IR 18/5861 Tithe Files, Congham). This has a resonance today. Research published in 2009 suggests that 21st century English woodlands are much less distinct than those of the early 20th century, due to an increase in soil fertility and the loss of light related to neglect and canopy shading (Keith *et al.* 2009).

Outside of enclosed woodland, areas of wood pasture continued to be managed. Many of these areas can be identified today as containing veteran trees.

Veteran trees

It has been estimated that Britain may be home to around 80 per cent of Northern Europe’s ancient trees. Veteran trees have been defined as “trees which by virtue of their great age, size, or condition are of exceptional value culturally in the landscape or for wildlife”. The presence of large old trees is the key characteristic of wood pastures and the main reason for these habi-

tats being of special biodiversity interest. The associated wood-decay and epiphyte communities are uniquely species rich. In addition, the veteran trees and pollards in hedgerows and otherwise open fields provide valuable stepping stones for wildlife from one wood pasture to another.

The Norfolk Veteran Tree project, run by Norfolk County Council and the University of East Anglia, has recorded some 5000 veteran trees. Their distribution informs us about such issues as tree dating, management regimes, how late new pollards were being created, relationships to the chronology of enclosure and the location and type of former wood pastures.

There are two striking features of our farmland veterans. First, the vast majority of hedgerow trees in Norfolk, and the overwhelming majority of large ‘veteran’ specimens are oaks. These are mainly Pedunculate Oak *Quercus robur*, but Sessile Oak *Q. petraea* occurs in an area from Trunch in the east to Swanton Novers in the west and Marsham in the south. Secondly, the overwhelming majority are pollards rather than standards. No less than 90% of the trees growing in fields and hedges with a girth of over 4.0 metres are pollards.

So why is there such a large preponderance of pollards? Firstly, trees in the farmed landscape were primarily regarded in economic terms, as sources of wood or timber. Standard trees that were being grown for timber would have been felled at 80-120 years old. Pollards, on the other hand, would have continued to have an economic importance late in life, so only pollards would have been allowed to reach a significant age. A more puzzling question is why hedgerow trees were pollarded at all. Pollarding is, in effect, aerial coppicing - a method of producing wood and fodder out of the reach of grazing livestock. It is clear, however, that at least by the 18th century most hedges were managed by coppicing, so why were hedgerow trees not coppiced

at the same time?

The most likely explanation is that oaks were cut on a longer cycle than the hedges in which they grew. The cycles were different because the produce required was different. Pollards were producing material with a larger diameter - firewood, fencing, or minor building components - rather than faggots for oven firing. In addition, oaks grew relatively slowly and might have been out-competed by other hedgerow shrubs if they had been coppiced with them. It is also possible that older hedgerow oaks might have been cut in the summer to produce fodder - 'leafy hay' - rather than during the traditional winter coppicing of hedges.

The dominance of oak also needs some explanation. Ash *Fraxinus excelsior* is the second most common tree. Of course, being less long-lived than oak it might be under-represented in the modern landscape, making oak appear to be more dominant than it originally was. However, there may be other reasons why Ash is not as common as might be expected. Ash has long been known as a greedy tree, depriving crops of water and nutrients, so the planting of ash was discouraged. In addition, Ash is a common hedgerow shrub, and would have supplied fuel wood from coppiced hedges. Old Ash trees are also less widely distributed than oaks. Oaks are found on all kinds of soils, but old Ash trees are rarely found on dry acid soils, preferring calcareous and, in particular, damp locations. Even on the claylands of south Norfolk there is a clear tendency for specimens to be concentrated on the damp plateau soils of the Beccles Association, besides streams or on floodplains.

Hornbeam *Carpinus betulus* is the third commonest veteran tree in the Norfolk countryside. Its distribution is even more strongly correlated with damper soils. The pollard material from Hornbeam was probably used mostly for fuel wood or fodder. Old Field Maples *Acer campestre* are

nearly as common as Hornbeams, but have a wider distribution. Both Hornbeam and Maple pollards are found in species-rich hedges and were probably pollarded in an opportunistic fashion rather than being planted as intended pollards.

Elm *Ulmus* sp. would, of course, have once been much more common than now. Elm was particularly valuable for fodder, but larger material would have been produced on a longer rotation for a wide range of building materials.

The 18th century saw increasing hostility to pollarding. As William Marshall put it: "We declare ourselves enemies to Pollards: they are unsightly; they encumber and destroy the hedge they stand in, and occupy spaces which might, in general, be better filled by timber trees". However, small farmers, in particular, continued to value their pollards and continued to create new ones right through the 18th and 19th centuries. Indeed, pollarding remained common practice well into the 20th century. Eighty two pollarded oaks have been recorded in the county with girths of two metres or less. Interestingly, these trees are clustered in one small area of the clays: from Attleborough in the west to Shotesham in the east and southwards to the Waveney valley. This concentration of young pollards is closely associated with the area where Beccles Association soils are most extensive and continuous. This was the area of the county where small owner-occupiers continued to form a major part of the farming community well into the 20th century, and the concentration of young pollards fits neatly into one of the only significant lacuna in the distribution of landscape parks in Norfolk - a telling example of the way in which social, economic and tenurial factors can structure the detail of the 'semi-natural' landscape.

Wood pasture

At least one Norfolk heath, Mousehold, was occupied by wood pasture well into the Middle Ages. Research now suggests

that many other Norfolk heaths carried a significant degree of tree cover for much longer than was previously thought. These include the area to the north of Norwich, the Goodsand ridge to the north of Kings Lynn and the Cromer-Holt ridge, as well as isolated fragments elsewhere. In addition, some commons on the heavier land of south Norfolk also clearly retained characteristics of wood pasture until much more recently than was previously thought. In this context it is noteworthy that several medieval deer parks – private wood pastures – are known from such locations, including the heathland areas mentioned above. These wood pastures were not equally common in all heathland areas of Norfolk. There is little evidence for wood pasture in the medieval period in Breckland or in the ‘Goodsands’ district of north-west Norfolk. The reason for this is the soil – the thin soils of Breckland and the Goodsands allowed cultivation at a much earlier period.

Deer parks

The importance of deer parks to scholars of the medieval landscape is well known, but their importance to biodiversity has been little appreciated. To the landscape historian, deer parks are important for three reasons. Firstly, they were places set aside for the management of deer so a study of parks illuminates the attitude of the medieval elite to their demesnes – the land owned by the Lord of the Manor. Secondly, the parks role in hunting sheds light on aristocratic attitudes to recreation and leisure. Thirdly, parks took extensive areas of land out of direct agrarian exploitation and thus impacted on the whole population, and it is this third reason – and its necessary association with where the deer parks were located – that has an interest for biodiversity.

Deer parks had existed in Norfolk before the Domesday Book (1086), with records of parks at Costessey and Holt and a deer hedge (‘haga’) at Hempnall (see Liddiard

2009). It is significant that Costessey and Holt lie on what would have been wooded heath, while Hempnall is situated on the woody claylands. More parks were established after Domesday, with the 12th century appearing to be the time when most of the county’s deer parks were established. About 100 parks are known to have existed in Norfolk, the largest, at Kenninghall, covering 700 acres.

Deer Parks were clustered in three main areas: a linear strip running north-south through west Norfolk, a crescent running through the centre of the county and a cluster to the north of Norwich in an area of former heath. This distribution correlates almost exactly with the distributions of both surviving Ancient Woodland and of woodland recorded in the Domesday Book. The wooded crescent is part of the Central Watershed and is characterised by poor soils and relatively high relief. The strip in the west of the county mirrors the distribution of Ancient Woodland and ancient woodland place names and the cluster of parks around Gaywood, Rising, Bawsey and Sandringham coincides with a hotspot of woodland place names. In addition, the cluster of parks to the north of Norwich on former heathland is of some interest as it had long been assumed to be an area largely devoid of trees and woodland. The distribution of parks suggests otherwise, with sites identified at Horsford, Haveringland, Hevingham, Skeyton, Burth-next-Aylsham and Cawston (Liddiard 2009). The conclusion would seem straightforward. Parks were being located in wooded areas. Conversely, where there were no parks there were few woodlands, or more accurately little wood pasture.

Elsewhere parkland may have helped preserve the remaining woodland. In Broadland there is a cluster of place names suggesting wood pasture in the Middle Saxon period which had largely disappeared by 1086. The imparkment of Acle wood may have been an attempt to preserve what was

by the 12th century a rare resource.

What of the future?

Fran Vera's book *Grazing, Ecology, and Forest History*, published in 2000, has generated much debate, and it is true that many (if not most) biodiversity policy documents fail to take account of the historical context of land management. At best, history begins with the first edition of the Ordnance Survey in the 19th century. But a fuller understanding of landscape history can help us in creating a vision for the future biodiversity of the county.

Vera's hypothesis concentrates on the pre-Neolithic landscape and contends that this landscape was not closed woodland, but a relatively open mosaic of trees and grassland, and that this mosaic was maintained by a population of large wild herbivores, some of which are now extinct. This is not the place in which to have a critical discussion of Vera's ideas, although it is important to note some of the problems: a lack of discussion of soil variation (and we have already seen how soils are one of the major drivers of land management through history); the generally much higher human populations in Britain which would have driven clearance and enclosure at earlier dates; the lack of shade tolerant tree species in Britain, apart from Hornbeam *Carpinus betulus* and Beech *Fagus sylvatica*, which would have allowed oaks and presumably limes *Tilia* spp. to dominate; and the fact that tree remains from lowland bogs generally have straight trunks, a narrow girth and few low branches – they appear to have grown in closed canopy conditions. Indeed the evidence in the UK is that large herbivores were widespread but rare prior to the Neolithic.

Vera has, nevertheless, ignited a useful debate about the future of conservation and conserving biodiversity and it is valuable to be looking at this in a Norfolk context. The debate should not be about whether 5000 years ago the landscape was half open (and

kept half open by large herbivores), or was completely closed (with herbivores having little role). Rather, the discussion should be about how we can create our own landscape history and at the same time maximise the biodiversity of Norfolk. To meet this objective we must seek every opportunity we can. The 'nature reserve' approach still has a valuable part to play. In essence this is what Ancient Woodlands, orchards and even veteran trees are. A great opportunity to increase the biodiversity value of Ancient Woodlands by managing them now exists in the form of markets for firewood, and Woodfuel East are actively promoting the wood supply chain and the installation of woodfuel boilers with the ultimate objective of bringing 15,000 ha of neglected woods into management over the next five years. Of course each site needs to be taken on its merits, but a general increase in management can only benefit biodiversity, as would increasing the size of many of Ancient Woodlands by judiciously allowing natural regeneration around them. There is now a recognition from central government of the value of extensive areas of new woodland planting, albeit as a means of carbon abatement, but we should take full advantage of this for biodiversity gain.

Orchards are more ephemeral in the landscape, so extensive planting of new orchards is to be encouraged. There are considerable opportunities for orchard planting with local communities on or around farms and country houses. Interest in orchards is at a high and the East of England Apples and Orchards Project has done much good work in galvanising this interest.

Hedges are important as habitats in themselves as well as links between other habitats. The need to get the design right has been discussed elsewhere, but we should avoid the recent tendency to sneer at hedge planting as akin to fiddling whilst Rome burns.

Veteran trees are often associated with

former wood pasture regimes, but a quick plea here. Apart from looking after what we have got - and fortunately we are much better at that than we used to be (re-pollarding neglected pollards has largely been dropped as an option, as it often kills the tree) - the plea is to leave some trees to become the veterans of the future, and also to introduce pollarding to a few selected trees.

This leaves the wider landscape, and how we might consider the possibilities for biodiversity. Work has already been done on this by the Norfolk Wildlife Trust (on behalf of the Norfolk Biodiversity Partnership), producing a document on *Making Space for Wildlife and People – Creating an Ecological Network for Norfolk*. This approach is now mirrored at the national level with an increased focus on landscape scale work being seen as the key delivery mechanism for biodiversity.

My analysis below largely excludes the wider social and economic factors affecting agriculture and biodiversity: in the next few years Norfolk will face major economic and demographic pressures – pressures that will further alter the dynamics between agriculture and biodiversity. On top of this is the prospect of coping with climate change, although this can be an opportunity to propose a type of re-wilding of extensive areas. My thoughts then are just that, simply a few ideas for debate and not in any form policy.

So, what can landscape history tell us about where we might look for opportunities for extensive habitat creation. This would include extensive areas of high forest as well as areas of wood pasture. The wood pasture areas would not necessarily follow the Vera model, but something akin, perhaps reflecting the reality that the rapidly increasing number of deer presents us with. Such a vision statement may, of course, not be compatible with other objectives. The extensive wood pasture landscape envisaged

depends on the development of a shifting mosaic of open grassland, heath and open woodland. In addition, timescales would need to be long – probably several generations of humans. Over and above this we need to be aware of the existing land and water policies and regulations.

So the areas we might take an interest in are:

- Parish and hundred boundaries.
- The woodland crescent.
- The heathland areas north of Norwich.
- The Goodsands ridge to the north of Kings Lynn.
- Riparian and floodplain sites.
- The Fens.

Parish and hundred boundaries

We know that many Ancient (enclosed) Woodlands lie on administrative boundaries. Smaller remnant sites which are not designated as Ancient Woodland also lie on these boundaries and opportunities exist to link these areas and create larger sites for biodiversity.

The wooded crescent

Again we know that this is where Ancient (enclosed) Woods, as well as remnant wood pastures lie. Targeting these for expansion as well as management will help create larger sites as well as buffer existing ones.

The heathland areas north of Norwich and the Goodsands ridge.

This includes all the areas from Mousehold, through Marsham, Cawston and Hevingham to the area along the Cromer-Holt ridge. Recent research suggests that many of these areas had a significant degree of tree cover well into the Middle Ages. These areas represent opportunities to create large areas of heath and heathy wood pasture - areas where trees are retained, regularly cropped, and replaced at intervals in what would be well managed environments, stable over long periods of time.

Riparian and floodplain areas

Recent work has shown that many of our Norfolk meadows were managed as wood pasture well into the early modern period. Rather than being distinct habitats, we should look upon woods and meadows as components of the same habitat. Of course, this is not to say that all riparian sites should become wet woodland or wood pasture. Indeed, isolated semi-natural grasslands should be kept free of scrub and tree invasion. Nevertheless we should seek opportunities to create wood pasture meadows and mosaics of woodland and grassland and not continue to separate the two habitats as conflicting alternatives.

The Fens

The juxtaposition of 'wold' place names in the south of the Fens makes us pause for thought, but of more immediate interest are the northern silt fens of Marshland. There is a widely held view that large scale tree planting in this area is out of place, violating the essential character of the area. An examination of the first edition of the Ordnance Survey, however, combined with other evidence, suggests that this area carried a density of up to 440 trees per square kilometre – mostly pollarded willows along ditches, dykes and roadside. Serious attempts should be made to restore some of this lost tree cover.

Conclusion

Landscape history can tell us about the genesis and evolution of our semi-natural environments more easily than it can tell us about what we should do with them in the future. Nevertheless, a knowledge of how our landscape has developed and changed can help us frame a vision for the future of biodiversity in the County.

Abbreviations

NRO Norfolk Record Office
PRO Public Record Office

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Dr G. Barnes P & T Dept., Norfolk County Council, County Hall, Martineau Lane, Norwich NR1 2SQ

Swanton Novers Wood NNR, Norfolk, and its Coleoptera: Supplement No.3

Bryan Sage

Introduction

This is the third supplement to the paper by Sage (2006) and follows on from Supplements Nos 1 & 2 (Sage 2007, Sage 2008a), it covers the years 2008 and 2009. The ride and compartment numbers referred to in the text can be found on Figure 1 in Sage (2006). The Summer Warden's reports for 2008 and 2009 have been drawn on in the preparation of this paper and they can be consulted in Natural England's office at Wolferton.

Visitors to the Great Wood during 2009 included, in April, Dr Martin Rezbek, an international authority on the longhorn beetles (Cerambycidae); in May, Dr Tony Drane, a national expert on the specialised scolytid beetles of the genera *Ernoporicus* and *Ernoporus* and, in November, Dr Oliver Rackham, an authority on historical ecology and the author of a number of books on trees and woodlands in the British landscape. (One of his recent books (Rackham 2006) is of particular interest to all who have a serious interest in the woodlands of Great Britain and he was involved, together with Dr George Peterken, in detailed research at Swanton Novers Woods in 1970 and 1975.)

Woodland history

Some interesting data on the early history of the woods has come to hand. The first edition (1885) of the six inch Ordnance Survey map shows the presence of conifers as well as broad-leaved trees in every compartment of Swanton Great Wood and indicates that they were more numerous in the north of the wood than in the south. In the second (1904) edition of this map the conifer symbols are confined to three areas where old Scots Pines are currently found,

as for example in Compartments 8 and 10. The oldest pine aged by John White in 2007 is in Ride 63 and was estimated to have been planted in 1872.

There is a problem of interpretation regarding the conifer symbols on the 1885 map due to changes in cartography standards over the past few centuries. It seems likely that towards the end of the 19th century mapping resolution was far coarser, so that a woodland parcel which was predominantly deciduous with conifers in part or parts of it would be represented as a mixed woodland throughout (Dr. George Peterken *in.litt.*). There are known instances of somewhat approximate OS mapping of conifer/broadleaf symbols, detected when the symbols indicating the presence of conifers change along the boundary of a sheet rather than a compartment when a wood happens to overlap two OS sheets. It is suspected that the surveyors might have looked from the outside, seen conifers but not mapped them from within. If they were surveying sheet-by-sheet such discrepancies may never have been discovered. John White has pointed out (*in.litt.*) that most of the great estates, especially in the northern part of Norfolk, planted fashionable European Silver Fir *Abies alba* in Victorian times, as for example at Felbrigg, Holkham and Sheringham Park. This does not seem to have been the case at Swanton Novers Great Wood, where small groups of Scots Pines *Pinus sylvatica* were planted at several locations over a one hundred year period between 1830 and 1930. The small scale of these plantings suggests that they were planted for aesthetic rather than commercial reasons.

If Scots Pines had been planted extensively

in the Great Wood by 1885, but had largely disappeared by 1904, then there is something of an anomaly. What happened to the conifers shown in 1885? Even if they had been felled soon after 1885, traces of them in the form of stumps, fallen logs etcetera would probably still have been visible in 1970 when George Peterken and Oliver Rackham commenced their investigation of the wood. Also, what happened to the spaces that these trees occupied? The north of the wood, with its widely-spaced oaks and sparse underwood, has room for pines to have once existed, although the notably broad spread of the oaks shows that they grew up without much competition. Conversely, the south of the wood has both numerous spreading oaks and closely-spaced coppice stools, so can have had little room for pines.

In 1885 both Great and Little Woods had a dense network of mostly irregular rides, many of which were different from the present rides. By 1904 the rides had been reorganized along much the same lines that they are now. The very wide rides that now exist (e.g. 60, 61, 63, 66-68) were created between 1972 and 1975.

Precipitation

The rainfall in the wood for the period September 2007 to August 2008 was 745.5 mm (an average of 62.1 mm per month) compared with 978.5 mm (an average of 81.5mm per month) for the same period in 2006-2007. Rainfall for 2007-2008 was just below the average (776.4 mm) for the past seven years; the summer was, however, quite wet, with the winter fairly dry. Heavy rain and some snow filled the ponds and saturated the ground, and the frequent days of rain kept the woodland wet through the summer until August when over 100 mm fell and swamped parts of the wood (Baker 2009).

The annual rainfall in the wood for the period September 2008 to August 2009 was 639.5 mm (an average of 53.3 mm per

month), making 2009 the driest since recording began eight years ago, being 16% below average. No month exceeded 100 mm of rainfall, and April and August were especially dry. June averaged 17.5 mm whilst July-August averaged only 8.4 mm per month (warden's figures). The months of December 2009 and January 2010 brought snow, and on a visit to the Great Wood on 9 January the snow was up to 10 centimetres deep and the trees and shrubs were snow-covered.

Ponds

During eight visits by the author between 6 January and 28 June 2008 the Compartment 4 pond and the north and south ponds in the Great Wood were full, and on 2 February all were frozen over. No visits to the ponds were made in July or August, but in view of the rainfall data given above they were probably full or near full. On 18 September the Compartment 4 pond had a little water in the centre, the north pond was about 70% full, and the water in the south pond was very low. On 9 December all three ponds were full as was also the case on 27 December, but the Compartment 4 pond was frozen over on the latter date.

On six visits between 4 January and 4 April 2009 all three ponds were full; all were frozen over on 4 January. The ponds were not checked by the author from May-August, but all were dry on 4 and 24 September. On 30 September the Compartment 4 and south ponds were dry, but a small amount of water was present in the north pond. A similar situation prevailed on 8 November when the north pond was about one-third full. Both the north and south ponds were dry on 26 November, but a small pool was present in the south pond. By 27 December all the ponds were nearly full but completely frozen over.

Woodland management

The removal of most of the larches (*Larix* spp.) from Compartment 9 began in the winter of 2008/2009. These had been plant-

ed during the second half of the 20th century. A survey of this compartment by the warden found a total of 486 broad-leaved trees of eleven different species scattered throughout, and these will be left in place. The most notable of these is an ancient pollarded Hornbeam *Carpinus betulus*. This represents the only known remaining Hornbeam on the reserve, possibly marking the most north-eastern limit of this species' natural extent in Britain.

Coppicing

Until recently the coppice management has involved the cutting of small sections (coupes) each year in order to maintain habitat diversity. In the winters of 2008/2009 and 2009/2010 much larger sections were cut, creating quite extensive areas of relatively even-aged coppice. In the south of the Great Wood Small-leaved Lime *Tilia cordata* and Hazel *Corylus avellana* constitutes most of the coppice, but recent coppicing has also taken out Silver Birch *Betula pendula* and Bird Cherry *Prunus padus*, neither of which have any value as coppice. The subject of coppicing, its advantages and disadvantages, are discussed at length by Peterken (1996).

Boundary trees

During the winter of 2008/2009 a total of 20 lime trees along the boundary of Ride 71 were re-pollarded six of these were, however, standard trees that had not previously been pollarded). An examination of some of the cut sections indicated that they had last been pollarded about 45-50 years ago. A further 11 lime trees (including one standard) along Ride 69 were similarly treated during the winter of 2009/2010, but three of these were left as single-stemmed trees. Following his visit in November 2009 Dr. Oliver Rackham had recommended that all the trees along the southern boundary of the Great Wood should be regarded as veteran trees, and that no further felling should take place.

Ride management

The ride running from Jubilee Avenue through Compartment 20 from east to west has been surfaced with carstone (see photograph p.145) in order to facilitate the movement of vehicles and heavy equipment. Until recently the rides in Swanton Novers were mown in September, either down the centre or along one side. As with the coppicing, the treatment of some of the wider rides has recently changed. Late in 2009, for example, Rides 60-61 (see photographs p.145), 64 and 65 were close-cut for most of their length to widths of approximately 31, 31, 16 and 24 metres respectively (i.e. to the woodland edge on both sides). Ride 68 was cut to a width of some 20 metres from the south edge of Compartment 10 to the edge of the track in Compartment 20 which had been surfaced with carstone. In addition, birch scrub along the edge of several rides has been removed and most of the wider rides now have little or no significant marginal scrub. The movement of heavy equipment or vehicles through the wood resulted in some deeply-rutted areas (e.g. parts of Rides 64 and 65, and Ride 48).

Woodland management and beetle habitats

The way in which a woodland is managed clearly has an effect on the diversity of habitats present. Insofar as beetles are concerned one of the most important groups are the saproxylic species, which are good indicators of the ecological quality of a woodland. They have specialised requirements centered on old and dying trees. There are, for example, the heart-rot species, an assemblage which requires trees to attain old age and for the heartwood to have been decayed by specialist fungi. As the tree reaches an advanced age the heartwood composed of lignin and cellulose dies, and is then subject to infection by fungi and various invertebrates. Depending on the fungus involved, this process produces either red/brown rot where the lignin remains undecayed, or white-rot where the

lignin and cellulose is broken down.

The wood decay habitat is one of the rarest in Europe and consequently hosts some of the rarest and most endangered species. The length of time that these trees stand provides a stability of habitat for species that are poor colonisers of new sites, and this includes some lichens and other epiphytes and the invertebrates associated with them. In addition, dead lower branches provide shelter, shade and lower humidity than the surrounding sward. Fungi growing on the bark of the trunk and branches, along with the mycelium beneath the bark, are also an important habitat for a range of beetles found in the fungi and/or beneath the bark.

There are 2050 invertebrate species completely dependent on rotten trees, comprising 7% of the fauna of Great Britain, 40% of which have conservation status (per Keith Alexander). The specialised ernoporine beetles require on-going supplies of moribund timber, either in the canopy of mature trees or moribund coppice poles that are producing die-back. Full details of the habitat requirements of the 92 saproxylic species can be found in Appendix 3. The recent management regime has not been saproxylic-friendly.

Biodiversity

Flora

Despite an extensive search by the warden, no May Lilies *Maianthemum bifolium* were found in 2008 or 2009 and it seems likely that this species is now extinct in Swanton Novers, although monitoring will continue. In Sage (2008a) mention was made of the fact that in 2007 Lily of the Valley *Convallaria majalis* continued to show an overall decline in the sample plots. In 2008 this long-running decline continued and the warden considered that it is general across the woods and not confined to the sample plots. Whilst there was a modest increase in 2009 the long-term trend is still

downwards, although it may prove to have bottomed out this year.

Mammals

Occasional Chinese Water Deer were seen by stalkers during 2008 and 2009 but no dates are available.

Birds

The following records have been selected from the warden's report for 2008. The Honey Buzzard did not breed within the reserve, but a pair of Common Buzzards nested near Compartment 20. A pair of Turtle Doves were again present in Little Wood. It was a poor year for Common Redstart with just one pair breeding in Compartment 10. Although a singing male Nightingale was present in Little Wood for most of April, breeding could not be confirmed. A singing male Wood Warbler was in Compartment 8 on 13, 26 and 28 May. Large numbers of Bramblings were seen in Browns Covert and Little Wood during late March, the maximum being 200 on 24 March.

In 2009, after several years of failure, a pair of Honey Buzzards bred in the Great Wood, and a pair of Hobbys almost certainly bred in the southern part of this wood. Two pairs of Common Redstarts also bred in the Great Wood. There was no evidence of breeding by the Turtle Dove. Unexpectedly, no Great Spotted Woodpeckers bred at all for the first time in over a decade. A Wryneck was seen in Compartment 4 (date not given), and a Nightingale in Little Wood on 28 April remained for only one day. There was a summer influx of Common Crossbills, the maxima being 52 in Compartment 8 on 16 July, 35 in Compartment 9 on 21 July and 60 in Compartment 10 on 7 August.

Butterflies (Lepidoptera)

Neither Dingy Skipper *Errynnis tages* nor Dark Green Fritillary *Measocidalia aglaja* were recorded in 2007- 2009, confirming their absence from the wood. Additionally neither Small Heath *Coenonympha pamphilus*

nor Green Hairstreak *Callophrys rubi* were seen in 2008 or 2009, so perhaps these will prove to be the next species to be classed as extinct at this site. A Camberwell Beauty *Nymphalis antiopa* was recorded on 5 May 2008 along the south edge of Compartment 20, the second record for the reserve. In 2009 5213 butterflies were counted on the transects from April-September, 34% above the 12-year average. However, this figure is partly influenced by the exceptional numbers of migrant Green-veined White *Artoeia napi* and Large White *Pieris brassicae*, but particularly the Painted Lady *Cynthia cardui* 392 of which were counted on the May-September transects. On 24 May huge numbers passed through the southern rides of the Great Wood in a constant stream and tens of thousands probably moved through the reserve whilst the migration was on. On the debit side numbers of Holly Blue *Celastrina argiolus* were 80% below the long-term average, and the White Admiral *Limenitis urticae* were over 50% below. In the case of the latter species it is thought that this could be a reflection of the extensive habitat management within the reserve in recent years, as this species is well known to dislike large-scale scrub removal (Baker 2009).

Moths (Lepidoptera)

Two species of macro-moth were added to the reserve list in 2009, bringing the total for this group to 405 species. These were the tortrix *Eucosmomorpha albersana*, a Notable A species, which was trapped in the Great Wood on 6 May, and White Point *Mythimna albipuncta*, found in Little Wood on 16 August.

One new species of micro-moth, Nettle Tap *Anthophila fabriciana*, was found in the Great Wood on 30 August 2008. In 2009 no fewer than nine species new to the reserve were recorded and these are listed below in alphabetical order:

Adela cuprella
Aleimama loeflingiana
Cataclysta lemnata
Cneohasia incertana

Crambus lathionellus
Pterophorus pendactyla
Schoenobius gigantella
Yponomeuta padella
Yponomeuta sequella

This brings the total number of micro-moths recorded to 154, and the overall moth list to 559 species.

Bush-crickets, grasshoppers and groundhoppers (Orthoptera)

During the early summer of 2009 the warden began a groundhopper survey in Great and Little Woods, and in July Mathew Heaton began work on the grasshoppers and crickets. These surveys resulted in the discovery of 10 species within the reserve; these were as follows:

Common Groundhopper *Tetrix undulata*
 Slender Groundhopper *Tetrix subulata*
 Dark Bush-cricket *Pholidoptera griseoaptera*
 Roesel's Bush-cricket *Metrioptera roselii*
 Speckled Bush-cricket *Leptophyes punctatissima*
 Oak Bush-cricket *Meconema thalassinum*
 Long-winged Conehead *Conocephalus discolor*
 Field Grasshopper *Chorthippus brumeus*
 Lesser Marsh Grasshopper
 Chorthippus albomarginatus
 Common Green Grasshopper *Omocestus viridulus*

The total of 10 species within the reserve warrants Swanton Novers Woods NNR being placed among the top Orthoptera sites in Norfolk. In addition the Meadow Grasshopper *Chorthippus parallelus* was found just outside the reserve.

The record of the long-winged form of Roesel's Bush-cricket is the first of this species for the reserve. The species has colonised Norfolk quite rapidly, and Figure 1 in Richmond (2008) shows how it has spread in the county since its first known breeding colonies were found around Santon Warren in the Brecks.

Dragonflies (Odonata)

The dragonfly list for Great and Little Woods currently stands at 19 species. In 2009 seven Red-eyed Damselflies *Erythromma najas* were seen at the clay pits ponds in July, and six Scarce Emeralds *Lestes dryas*

were found at the Forest Lane pond also in July. Both these sites are just outside the reserve boundary, but it is quite possible that either or both species will eventually occur at one or more of the ponds in the Great Wood.

False-scorpions (Pseudoscorpiones)

In Supplement No.1 (Sage 2007) one species of false-scorpion, *Neobisium muscorum* was recorded, having been found in a litter heap in Ride 61 of the Great Wood. On 18 February 2009 another litter heap in the same ride again yielded this species, and also three further species – *Chthonius ischnocheles*, *C. orthodactylus* and *Pselaphochernas scorpioides*. As before, these were identified by reference to Legg & Jones (1988).

Spiders (Araneae)

An unpublished report (Shardlow 1997) located in the Natural England files at Wolferton lists 48 species of spiders collected at Swanton Novers in 1995 by M Tunmore and MEA Shardlow. All but one species (*Evarcha falcata*) were taken in pitfall traps in Great and Little Woods. The full list of species is given in Appendix 1. The author suggests that this probably represents about 50% of the number of species in the ground fauna. Additional collecting methods would reveal many additional species, and a final list for the site could be in the region of 220 species.

Woodlice (Isopoda)

In Sage (2007) the unexpected discovery of *Armadillidium pulchellum* in the Great Wood was reported. Subsequent to this an unpublished report (Shardlow 1997), referred to above, lists a total of five additional species collected by Mark Tunmore in 1995 as a result of pitfall trapping in Great and Little Woods. These were – *Ligidium hypnorum*, *Philoscia muscorum*, *Porcellio scaber*, *Oniscus asellus* and *Trichoniscus pusillus*. The author of this report pointed out that there would be additional soil-living species, and that a complete list for this site would probably be about nine species.

Beetles (Coleoptera)

Two corrections need to be made to Appendix 1 in Sage (2007). Firstly, *Stenus (Hemistenus) impressus* (Staphylinidae) should be deleted since it was first recorded in 1995 and listed in Appendix 3 in Sage (2006). Secondly, *Demetrias atricapillus* should be added to the Carabidae. This species was mentioned in the main text (page 109) but omitted from the appendix. The total number of species recorded in Great and Little Woods up to the end of 2007 was 568 Sage (2008a). During 2008/2009 a further 47 beetle species were added and these are listed in Appendix 2 where, for ease of reference, both families and species are in alphabetical order. The total at the end of 2009 stands at 616 species

In July and August 2009 there was a major influx into this country of 7-spot Ladybirds *Coccinella 7-punctata* (there is, however, also a school of thought suggesting that these swarms originated in this country and were not immigrants). In July several hundreds were noted in the Great Wood. Numbers increased rapidly and by August tens of thousands were present in all the reserve woodlands (Baker 2009).

The number of rare or scarce species, using Hyman & Parsons (1992 & 1994) as the reference point, was 48 at the end of 2007 (Sage 2008a). In 2008 one further species – *Ampedus elongantulus* (Nationally Notable (Scarce) Category A) was added, bringing the total to 49 and increasing the number of species in this category from five to six (see Table 1). This was the first record of this species for Norfolk (Sage 2008b), and the map in Mendel & Clarke (1996) shows that it has a predominantly southern distribution with records from Northamptonshire being the closest to Norfolk. There were three additions in 2009. The chrysomelid beetle *Altica brevicollis* (Nationally Notable (Scarce) Category A) was added bringing the total number of species in this category to seven. This is the first modern record of this species for Norfolk. It was listed, as

Haltica coryli, by Edwards (1893) as occurring sparingly on Hazel in Foxley Wood. The staphylinid *Atheta pilicornis* (Nationally Notable (Scarce) (Notable)) was added increasing the number of species in this category from two to three. This was the first record of this species for Norfolk (Sage 2010a). Finally, the cardinal beetle *Pyrochroa coccinea* (Nationally Notable (Scarce) Category B) was also added (by Robert Baker), bringing the total number of species in this category to 37; this is the third Norfolk record. All these additions are taken account of in Table 1.

Table 1. Totals of rare or scarce species of Coleoptera recorded.

Category	No. of species
RDB1 (Endangered)	1
RDB2 (Vulnerable)	1
RDB3 (Rare)	2
RDBK (Insufficiently known)	1
Nationally Notable (Scarce) Category A	7
Nationally Notable (Scarce) Category B	37
Nationally Notable (Scarce) Notable	3
TOTAL	52

The most surprising event was the discovery of the chrysomelid *Chrysolina coerulea* found by sweeping vegetation along the E-W ride in Compartment 20 on 15 June 2008, the first record for Norfolk and only the second for Great Britain (Sage 2009 a,b). On 27 June 2009 a specimen of *Agrilus cuprescens* was found in a flight interceptor trap near Ride 61, and this proved once again to be the first record for Norfolk and only the second record for Great Britain (Sage 2010b). The larvae of this jewel beetle bore spiral tunnels under the bark of various species of *Rosa* and *Rubus*.

Among the new species recorded in

2008/2009 are some that are worth further comment. The weevil *Apion curtirostre* is associated with *Rumex* spp. and it is surprising that it had not been found before. The ground beetle *Agonum emarginatum* is found in marshes and near fresh water, and in the Great Wood was found on damp mud in Ride 57 and at the pond in Compartment 4. Sweeping vegetation on the muddy bed of this pond produced several species of Chrysomelidae. One of these, *Phaedon cochleariae*, is associated with Greater Yellowcress *Rorippa amphibia* which is present in this pond. The quite striking *Chrysolina hyperici* was swept from a St John's-wort *Hypericum* sp. in Compartment 20. Also at the south end of the Great Wood, *Lema cyanella* was taken on thistles *Cirsium* sp. in ride 66. The example of *Altica brevicollis* mentioned above was beaten from Hazel in Ride 57; it is thought that this species may feed only on Hazel. One of the two new species of longhorn beetle (Cerambycidae) is the Spruce Shortwing Beetle *Molorchus minor* which was found in Compartment 8 and is associated with the dead wood of various coniferous trees. It is a naturalised introduction from North America and there are six previous Norfolk records. The one new pollen beetle (Nitidulidae) is *Meligethes atramentaria* which was found on Yellow Archangel *Lamium galeobdolon* in Ride 58.

Litter heaps are often a good medium for beetles and in 2006 no fewer than 26 new species were added to the site list (Sage 2007). In 2007 seven species were added (Sage 2008). During 2008/2009 six new species were found by sieving litter heaps:

- Catops chrysomeloides*
- Myllaena brevicornis*
- Oxyopoda acuminata*
- Stenus pallipes*
- Tachyporus dispar*
- Xylodromus depressus*

It can be seen that the number of new species found by sieving litter heaps has declined since 2006. Whilst diminishing returns are to be expected, it is worth not-

ing that the physical structure of the litter heaps has changed in that they now consist of finer material which seems to be less attractive to beetles. Also, the sheer volume of litter present in the winter of 2009/2010 made finding beetles much more difficult. Seven of the 2008/2009 additions are saproxylic species and these are discussed below.

Saproxylic beetles

Saproxylic invertebrates are some of the most threatened species in Britain. The present-day fauna includes relic elements of a fauna that was associated with the unmanaged forest cover in the first half of the Holocene (11500-8900 years ago). Appendix 5 in Sage (2006) listed 72 species of saproxylic beetles. This figure included *Denticollis linearis* (SQI score 1) which had been omitted from the appendix in error. The larvae of this species are found under bark or in the decaying heartwood of broad-leaved trees and *Pinus* species. In Supplement No.1 (Sage 2007) a further eight species were added to the list bringing the total up to 80 and increasing the Saproxylic Quality Index (SQI) to 417.5. The total was increased in Supplement No.2 (Sage 2008a) by the addition of a further two species to bring the total to 82. However, one further species, *Oedemera virescens*, also found in 2007, should have been included there. This species has an SQI score of 24 which thus raised the index to 440.9. During 2008/2009 a further nine species with a total SQI score of 26 were added and these are identified with an * in Appendix 2. Another addition is *Epuraea biguttata* with a score of two. This species was first found in 1995 when its SQI status was overlooked. The total number of saproxylic species is therefore 93, but since all of these latest additions are low scoring species the SQI falls to 422.6. The only other evaluated sites in Norfolk (as at September 2009) are Felbrigg Great Wood (SQI 377.6), Blickling Park (SQI 391.5) and STANTA military area (SQI 487). In the interest of clarity the 93 saproxylic species are listed

in Appendix 3.

In Sage (2006) 14 saproxylic species known to be primarily or particularly associated with ancient woodland and ancient wood-pasture were listed. One other species – *Platycis minutus* (taken in 2001) – should have been included in this list, thus bringing the total to 15. One further species, *Rhizophagus nitidulus*, was added in 2007 (Sage 2008a), and four species found in 2008/2009 (*Ampedus elongantulus*, *Cis pygmaeus*, *Orchesia undulata* and *Pyrochroa coccinea*) also belong in this group, thus bringing the total to 20. These are as follows:

Ampedus elongantulus
Agrilus pannonicus
Ampedus quercicola
Bitoma crenata
Cerylon ferrugineum
Cerylon histeroides
Cis pygmaeus
Conopalpus testaceus
Eledona agricola
Enicmus rugosus
Hallomenus testaceus
Melandrya caraboides
Mycetophagus piceus
Orchesia undulata
Phymatodes testaceus
Platycis minutus
Prionychus ater
Pyrochroa coccinea
Rhizophagus nitidulus
Sinodendron cylindricum

Index of Ecological Continuity

This concept was discussed and explained in detail by Sage (2007) at which point 22 of the 80 species of saproxylic beetles found at Swanton Novers Wood NNR qualified to be used in calculating the IEC (30), and 20 species for calculating the Revised Index of Ecological Continuity (RIEC) (28). Swanton Novers was shown to be a site of National Importance. Additions to the site list in 2007 did not include any further species in this category. However, in 2008 the click beetle *Ampedus elongantulus* was recorded, and in 2009 *Orchesia undulata* and *Pyrochroa coccinea* were found. All three are qualifying species and fall in Group 3 in Harding & Rose (1986). The revised figures are,

therefore, IEC 33 and RIEC 31. The full list is given in Appendix 4.

Species list

Since in excess of 100 further species of beetle have been added to the site list since Sage (2006), and various taxonomic changes have also taken place, it is desirable to update the site species list in line with the latest British checklist (Duff 2008) and this is done in Appendix 5, which lists 616 species.

Discussion

There can be no doubt that the type of management pursued has a direct impact on the biological diversity of the wood. Although in terms of species numbers, particularly of beetles, the biodiversity of the wood appears to be increasing, this is probably related more to the intensity of research rather than to habitat management. There is some evidence that species are also being lost. The May Lily is now extinct in the Great Wood, and the Lily-of-the-Valley has apparently suffered a long-term decline. Returns from pitfall trapping for beetles in the recent lime coppice areas have declined markedly to the point where only two or three species are taken on most occasions. These are the ground beetles *Carabus nemoralis* and *Pterostichus madidus*, and staphylinids of the genus *Philonthus*. Two species of Butterfly, the Dingy Skipper and the Dark Green Fritillary have not been seen since 2007, and must be regarded as extinct. Two further species, the Green Hairstreak and the Small Heath, were not seen in 2008 or 2009 and may also have gone. In 2009 Holly Blue numbers were 80% below the long-term average, and White Admiral numbers 50% below.

One of the Small-leaved Lime trees was repollarded by being razed down to the boling. This was a fairly old pollard the dead and dying small branches and twigs of which supported a colony of the rare scolytid beetle *Ernoporicus caucasicus* an RDB1 (Endangered) species. This colony was lost

because all the brush was burnt.

Insofar as birds are concerned, the Willow Warbler breeding numbers have shown a steady decline in the past 2-3 years and it is suggested that, in part, this may be due to birch removal along some of the ride edges (Baker 2008). An analysis of the number of breeding territories for 32 species of bird that bred in the Great Wood in 2005 (a period when management was low key) and 2009 shows that 22 species (68%) showed a decrease in the number of territories ranging from 10% to 100%; five species (16%) showed no change, and five species (16%) showed an increase. The greatest decreases were for Great Spotted Woodpecker (100%), Dunnock (75%), Willow Warbler (74%), Bullfinch (73%) and Long-tailed Tit (66%). Common bird survey figures from Great Wood in 2009 indicates that out of 35 breeding species, no less than 17 (49%) showed a decrease in the number of breeding territories compared with 2008 (data from Baker 2009). It is not suggested that management alone is responsible for all of these changes or trends although it must have played a major part, but other factors are also involved. The Willow Warbler for example has shown a decline throughout southern Britain in recent years.

Summary

In the light of the data presented in this paper Table 3 in Sage (2008) can now be updated (Table 2).

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Table 2. Total species at Swanton Novers.

Group	No. of species
Vascular plants	331
Bryophytes	76
Lichens	35
Fungi	753
Butterflies	28
Moths	559
Dragonflies	19
Beetles	616
Bush-crickets, grasshoppers and groundhoppers	10
Leafhoppers	9
False-scorpions	4
Woodlice	6
Birds	74 (b)
Mammals	25
Reptiles and amphibians	8

(a) Under-recorded.

(b) Includes only those species seen in Great and Little Woods, species only seen over the woods are excluded.

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**B Sage Waveney House, Waveney Close,
Wells-next-the-Sea, Norfolk NR23 1HU.**

APPENDIX 1: Checklist of spiders recorded at Great and Little Woods, Swanton Novers in 1995. For ease of reference the families and species are listed in alphabetical order. Authorities for scientific names are given in Appendix 5.

Clubionidae

Agroeca brunnea
Clubiona terrestris

Linyphiidae

Agyueta ramosa
Bathypantes gracilis
Bathypantes parvulus
Diplostyla coucolor
Dicymbium nigrum
Dicymbium tibiale
Diplocephalus picinus
Erigone atra
Gonatium rubellum
Gongylidiellum vivum
Gongylidium rufipes
Lepthyphantes alacris
Lepthyphantes ericaeus
Lepthyphantes flavipes
Lepthyphantes mengei

Lepthyphantes pallidus
Lepthyphantes tenebricola
Lepthyphantes tenuis
Lepthyphantes zimmermanni
Meioneta saxatilis
Micrargus herbigradus
Nerienne peltata
Oedothorax fuscus
Oedothorax retusus
Pocadicnemis juncea
Pocadicnemis puuila
Saaristoa abuormis
Walckenaeria acuminata
Walckenaeria atrotibialis
Walckenaeria cucullata

Lycosidae

Alopecosa pulverulenta
Pardosa lugubris
Pardosa prativaga

Pardosa pullata
Pilata hygrophilus
Trochosa terricola

Pisauridae

Pisaura mirabilis

Salticidae

Evarcha falcata

Tetragnathidae

Pachygnatha clercki
Pachygnatha degeeri
Pachygnatha listeri
Tetragnatha montana

Theridiidae

Euoplognatha ovata
Euoplognatha thoracica
Robertus lividus

Zoridae

Zora spiuimana

**APPENDIX 2: Additional species of Coleoptera recorded at Swanton Novers Wood NNR
2008/2009.** * Qualifying saproxylic species. Authorities for scientific names are given in Appendix 5.

Species	Date	Loc	Capture	Species	Date	Loc	Capture
Apionidae				Curculionidae (cont.)			
<i>Apion (Perapion) curtirostre</i>	15.6.08	R 64	<i>Rumex</i>	<i>Phyllobius roboretanus</i>	15.6.08	LW	swept
Buprestidae				Elaeteridae			
<i>Agrilus cuprescens</i>	27.6.09	R 61	FIT	<i>Ampedus elongantulus</i> *	15.6.08	R 58	old oak
Cantharidae				<i>Adrastus pallens</i>	6.5.09	R 57	swept
<i>Malthodes marginatus</i> *	15.6.08	LW	swept	<i>Athous bicolor</i>	30.5.09	R 61	FIT
Carabidae				Endomychidae			
<i>Agonum emarginatum</i>	2.5.09	R 57	damp mud	<i>Endomychus coccineus</i> *	29.8.08	R 57	swept
<i>Agonum gracile</i>	20.5.09	R 61	PFT	Histeridae			
<i>Agonum fuliginosum</i>	20.5.09	R 61	PFT	<i>Margarinotus merdarius</i>	30.5.09	C 4	FIT
<i>Anchomenus dorsalis</i>	30.5.09	R 61	PFT	<i>Margarinotus ventralis</i>	27.6.09	R 61	FIT
<i>Calodromius spilotus</i>	8.4.08	C 18	PFT	Kateretidae			
<i>Nebria salina</i>	26.8.08	C 18	PFT	<i>Brachypterus glaber</i>	15.6.08	LW	<i>Urtica</i>
<i>Ocys harpaloides</i>	30.9.09	C 4	under pond bark	Leiodidae			
Cerambycidae				<i>Catops chrysomeloides</i>	9.12.08	R 64	litter heap
<i>Molorchus minor</i>	20.5.08	C 8	Black-thorn	Melandryidae			
<i>Pogonocherus hispidulus</i> *	28.6.08	R64	swept	<i>Orchesia undulata</i> *	20.5.09	R 43	S-leaved Lime
Chrysomelidae				Nitidulidae=			
<i>Altica brevicollis</i>	6.5.09	R 57	Hazel	<i>Epuraea silacea</i> *	29.4.09	R 61	PFT
<i>Chrysolina coerulens</i>	15.6.08	C 20	swept	<i>Meligethes atramentarius</i>	2.5.09	R 58	<i>L. galeobdolon</i>
<i>Chrysolina hyperici</i>	28.6.08	C 20	<i>Hypericum</i>	Pyrochroidae			
<i>Lema cyanella</i>	6.7.09	R 66	<i>Cirsium</i>	<i>Pyrochroa coccinea</i> *	29.5.09	R 57	
<i>Phaedon cochleariae</i>	15.9.09	C 4	<i>Brassica</i> pond	Staphylinidae			
<i>Phaedon tumidulus</i>	15.9.09	C 4	<i>Hera-cleum</i> pond	<i>Atheta pilicornis</i>	20.5.09	R 61	PFT
<i>Phyllotreta nemorum</i>	15.9.09	C 4	<i>Brassica</i> pond	<i>Myllaena brevicornis</i>	26.11.09	R 64	litter heap
<i>Phyllotreta nigripes</i>	15.9.09	C 4	<i>Brassica</i> pond	<i>Oxypoda acuminata</i>	9.12.08	R 61	litter heap
Ciidae				<i>Phloeostiba plana</i> *	28.9.08	R 58	u. bark, dead oak
<i>Cis pygmaeus</i> *	28.9.08	R 58	oak **	<i>Stenus (Hemistenus) pallipes</i>	27.11.08	R 63	litter heap
Coccinellidae				<i>Tachyporus dispar</i>	27.8.08	R 61	litter heap
<i>Harmonia axyridis</i>	13.6.09	C 19	R Baker	<i>Xylodromus depressus</i>	19.11.08	R 61	litter heap
Curculionidae				<hr/>			
<i>Coelositona cambricus</i>	8.4.08	C 20	PFT	47 species			
<i>Curculio glandium</i>	11.6.08	R 57	oak				
<i>Datonychus melanostictus</i>	6.5.09	R 57	<i>Mentha</i>				
<i>Microplontus campestris</i>	30.5.09	C 4	FIT	** On fungus-infected oak twigs.			
<i>Orchestes pilosus</i>	15.6.08	C 15	Birch	FIT Flight interceptor trap.			
				PFT Pitfall trap.			

APPENDIX 3: Swanton Novers Woods - qualifying saproxylic species 2009. Authorities for scientific names are given in Appendix 5.

Species	Score	Year	Ecology
Anobiidae			
<i>Grynobius planus</i>	2	2000	Develops in dead timber of various broad-leaved trees.
<i>Ptilinus pectinicornis</i>	1	1998	Bores in exposed dry heartwood of old broad-leaved trees.
Bupestridae			
<i>Agrilus laticornis</i>	8	2001	Larvae in dying branches of oak.
<i>Agrilus pannonicus</i>	8	2004	Larvae tunnel in and under thick oak bark, mainly old dying and dead trees.
Cantharidae			
<i>Malthinus flaveolus</i>	1	1988	Widespread in broad-leaved woodland and hedgerows.
<i>Malthodes marginatus</i>	1	2008	Larvae develop in decaying wood or beneath bark on dead timber.
<i>Malthodes minius</i>	1	2001	Common and widespread in the south and east.
Cerambycidae			
<i>Alosterna tabacicolor</i>	2	2000	Larvae in old damp rotten stumps of hazel, hornbeam, maple and pine.
<i>Arhopalus rusticus</i>		2002	
<i>Clytus arietis</i>	1	1999	Develops in a variety of dead broad-leaved trees.
<i>Grammoptera ruficornis</i>	1	2000	Larvae in dead twigs and decaying small branches of many broad-leaved trees.
<i>Leiopus nebulosus</i>	2	2001	Larvae bore beneath bark of dead lower branches of oak and other trees.
<i>Stenurella melanura</i>	2	1997	Larvae in thin, decayed oak branches and in Broom roots.
<i>Phymatodes testaceus</i>	4	2004	Develops in dead branches, dead boles and logs of various broad-leaved trees.
<i>Poecilium alni</i>	16	2005	In recently dead or decaying twigs and slender branches of various broad-leaved trees.
<i>Pogonocherus hispidulus</i>	2	2008	Larvae develop in deadwood of a variety of tree species.
<i>Rhagiium bifasciatum</i>	1	2000	Develops in rotten boughs, stumps and trunks.
<i>Rhagiium mordax</i>	1	1995	Larvae develop in decaying timber, preferring the cambium and outer sapwood of rotting boles or stumps; most often in oak.
<i>Rutpela maculata</i>	1	2001	Develops in moist rotting wood of stumps and roots of broad-leaved trees and pine, but particularly birch.
<i>Stenocorus meridiannus</i>	2	2004	Develops in stumps and dead roots of a wide range of trees.
<i>Tetrops praeusta</i>	2	2000	Probably develops in dead branches.
Cerylonidae			
<i>Cerylon ferruginium</i>	2	2004	Develops beneath bark on dead broad-leaved timber in the early stages of decay; feed on fungal hyphae and spores.
<i>Cerylon histeroides</i>	4	2004	In fungoid and decaying timber of various broadleaves, and pine.
Ciidae			
<i>Cis boleti</i>	1	2004	Develops in the mature fruit bodies of the fungus <i>Trametes versicolor</i> .
<i>Cis pygmaeus</i>	2	2008	Larval ecology not known. Adults reported to be attracted to the fungus <i>Ascodichaena rugosa</i> on moribund peripheral twigs of oak.
<i>Ennearthron cornutum</i>	2	2005	Larvae develop in the fruiting bodies of various bracket fungi.
Colydiidae			
<i>Bitoma crenata</i>	4	2004	Mainly beneath bark on dead Beech and oak when in the early stages of decay and still sappy, also less frequently on birch.

Species	Score	Year	Ecology
Cryptophagidae			
<i>Cryptophagus micaceus</i>	16	2002	In tree hole nests of hornet and social wasps, also reported from rotting timber, sap fungi and nest debris.
<i>Henoticus serratus</i>	2	1999	Under bark on deadwood or at blossom, near fresh water.
Cucujidae			
<i>Pediacus dermestoides</i>	4	2006	Develops beneath bark on dead broadleaved timber in the early stages of decay.
Curculionidae			
<i>Ernoporicus caucasicus</i>	16	1997	In bark of dead branches of both species of lime, perhaps only in sites where Small-leaved Lime has been present historically.
<i>Hylesinus crenatus</i>	2	2003	Chiefly in dying ash, but also in oak, in rather thick bark of trunk.
<i>Hylesinus varius</i>	1	1997	In ash; standing and fallen recently dead trunks and boughs.
<i>Hylobius abietis</i>		1997	
<i>Magdalis carbonaria</i>	4	1998	Associated with dead birch.
<i>Magdalis cerasi</i>	4	2007	Develops in dead boughs and branches, especially of Rosaceae, although also found on oak.
<i>Scolytus intricatus</i>	2	1999	Develops under bark of sickly or freshly dead oak boughs and branches, and also in other broadleaves.
Elateridae			
<i>Ampedus elongantulus</i>	8	2008	Larvae in red-rotten wood of oak.
<i>Ampedus quercicola</i>	8	2004	Develops in decayed heartwood of birch, beech, hawthorn and probably other trees.
<i>Denticollis linearis</i>	1	1999	Larvae under bark in decaying heartwood; broad-leaved trees and <i>Pinus</i> .
<i>Melanotus villosus</i>	1	2001	Larvae most frequently develop in red-rotted timber, but also in decaying wood generally.
<i>Stenagostus rhombeus</i>	4	2002	Larvae develop under loose bark of deadwood of various broad-leaved trees, and sometimes in the relatively soft heartwood beneath.
Endomychidae			
<i>Endomychus coccineus</i>	2	2008	On fungoid growths on dead beech, but also on apple, Crack Willow, Horse-chestnut and birch.
Erotylidae			
<i>Dacne bipustulata</i>	2	2005	Adults in fruiting brackets of the softer polypore fungi on trunks of broad-leaved trees.
<i>Dacne rufifrons</i>	2	2005	
<i>Triplax russica</i>	4	1993	Develops in fungul fruiting bodies on various broad-leaved trees.
Eucnemidae			
<i>Melasis bupestroides</i>	4	1998	Develops in rather hard dead timber, especially boughs, of a wide variety of broad-leaved trees, standing and fallen timber.
Latridiidae			
<i>Enicmus rugosus</i>	8	2005	In slime mould on trees, often under bark of dead wood, mainly oak.
Leiodiidae			
<i>Agathidium nigrinum</i>	2	2006	Under bark on dead timber, usually associated with fleshy fungi.
<i>Anisotoma humeralis</i>	2	1998	Develops in slime fungi under bark on the trunks or fallen boughs of dead trees, adults found in ripe powdery stage, also in bracket fungi.
Lucanidae			
<i>Dorcus parallelipipedus</i>	2	1995	Larvae develop in heartwood of various broad-leaved trees where it is being decayed by a white-rot fungus.
<i>Sinondendron cylindricum</i>	2	2004	Bores in dead heartwood of large broad-leaved trees, and also pine, including stumps.

Species	Score	Year	Ecology
Lycidae			
<i>Platycis minuta</i>	8	2001	Larvae develop in large relatively soft moist decaying heartwood, especially Beech and probably Ash.
Melandryidae			
<i>Conopalpus testaceus</i>	8	1998	Develops in decaying boughs and branches, especially oak, also of Hazel.
<i>Hallomenus binotatus</i>	8	2005	Develops in the fruiting bodies of large bracket fungi.
<i>Melandrya caraboides</i>	4	2000	Develops in relatively soft moist white-rotted heartwood of boughs, trunks and stumps.
<i>Orchesia undulata</i>	4	2009	Larvae develop in decaying dead branches of oaks, and may be associated with the fungus <i>Exidia glandulosa</i> .
Melyridae			
<i>Dasytes aeratus</i>	2	2000	Adults usually found at blossom, especially on hawthorn. The larvae are canivorous.
<i>Malachius bipustulatus</i>	1	2001	Larvae partly predatory in holes of wood-borers.
Monotomidae			
<i>Rhizophagus bipustulatus</i>	1	1997	Adults and larvae under bark of most dead broad-leaved trees; feed on fungal hyphae.
<i>Rhizophagus dispar</i>	1	1998	Under bark of most dead broad-leaved trees, and in bracket fungi.
<i>Rhizophagus fenestralis</i>	24	2006	Under bark of dead broad-leaved trees.
<i>Rhizophagus nitidulus</i>	4	2007	Under sappy bark of freshly dead wood of various broad-leaved trees.
Mycetophagidae			
<i>Mycetophagus multipunctatus</i>	2	2005	In fungi on broad-leaved trees.
<i>Mycetophagus piceus</i>	4	2005	Adults feed on fruiting bodies of bracket fungi.
<i>Mycetophagus quadripustulatus</i>	2	1995	Adults found beneath fungoid bark and at soft bracket fungi, on a wide range of broad-leaved trees; develops most frequently in the fruiting bodies of <i>Polyporus squamosus</i> .
Nitidulidae			
<i>Cryptarcha strigata</i>	8	2006	Associated with freshly exposed and fermenting sap on oak.
<i>Eपुरaea biguttata</i>	2	2008	Under sappy bark on dead timber and in bracket fungi.
<i>Eपुरaea distincta</i>	8	2006	Develops in the bracket fungi <i>Daedaleopsis confragosa</i> on waterside willows.
<i>Eपुरaea marsueli</i>	1	1995	At flowers, under sappy bark of deadwood and in tree fungi.
<i>Eपुरaea silacea</i>	1	2009	At flowers, under sappy bark on deadwood, and in bracket fungi.
<i>Soronia punctatissima</i>	2	1995	Associated with oak and Alder; attracted to sappy stumps, as well as trees attacked by Goat Moth and clearwing moths.
Oedemeridae			
<i>Oedemera virescens</i>	24	2007	See footnote (a)
Pholiophilidae			
<i>Pholiophilus edwardsi</i>	8	2006	Develops in the fungus <i>Phlebia merismoides</i> which grows on the bark of dead boughs and branches of various broad-leaved trees.
Pyrochroidae			
<i>Pyrochroa coccinea</i>	4	2009	Larvae develop under bark of freshly dead broad-leaved timber.
Salpingidae			
<i>Rhinosimus plautirostris</i>	1	1997	Under bark on various broad-leaved trees in early stages of decay; normally saprophagous.
Scraptiidae			
<i>Anaspis fasciata</i>	2	1988	Adults have been reared from fallen oak branches and bark, and twigs and branches of Hornbeam and larch.

Species	Score	Year	Ecology
<i>Anaspis frontalis</i>	1	1988	Adults have been reared from oak, and are frequently seen on hawthorn blossom.
<i>Anaspis lurida</i>	2	1995	ditto
<i>Anaspis pulicaria</i>	1	1988	See footnote (b).
<i>Anaspis rufilabris</i>	1	2002	Develops in the rotten wood of various broad-leaved trees; adults frequently on hawthorn blossom.
Sphindidae			
<i>Aspidiphorus orbiculatus</i>	2	2000	Breeds exclusively in slime fungus spore bodies.
Staphylinidae			
<i>Coryphium angusticolle</i>	2	1995	Under bark and in red-rotten oak.
<i>Gabrius splendidulus</i>	1	2002	Under bark, especially of Beech.
<i>Gryophaena lucidula</i>	8	2001	In fungi on trees, including <i>Lentinus tigrinus</i> and <i>Gymnophilus junonius</i> on ash stumps in wet woodlands.
<i>Hapalarea pygmaea</i>	2	1988	Found in bracket fungi, bird nests and squirrel drays in tree canopy, rotten wood etc.
<i>Phloeostiba plana</i>	2	2008	Larvae under bark feeding on sap and insects.
<i>Quedius maurus</i>	4	1997	Rather strictly subcortical, and in moist crumbly rotten wood.
<i>Quedius scitus</i>	8	1999	Usually subcortical, in moist crumbly red-rot of various broad-leaved trees.
<i>Thamiaraea cinnamomea</i>	2	2006	At the exuding frass of Goat Moth colonised trees.
Subfamily Scaphidiinae			
<i>Scaphidium quadrimaculatum</i>	2	1997	Fungivorous in rotting timber.
<i>Scaphisoma boleti</i>	8	2006	A specialist of wood-decay fungi.
Tenebrionidae			
<i>Diaperis boleti</i>	24	2004	Develops deep inside large brackets of <i>Piptoporus betulinus</i> on birch.
<i>Eledona agricola</i>	4	1981	Develops primarily in the fruiting bodies of <i>Laetiporus sulphureus</i> .
<i>Prionychus ater</i>	8	1988	Larvae most often develop in black wood mould in hollowing broad-leaved trees.
TOTAL 93 species	393		SQI = 422.6

Excludes *Hylobius abietis* and *Arhopalus rusticus* which are associated with conifers.

a. This species is listed by Fowles & Alexander (1999), but Alexander (2002) states that there is no firm evidence of its association with wood decay.

b. This species is listed by Alexander (2002), but Levey (2009) states that it is usually found in more open habitats rather than woodland, and that the larval host is unknown.

APPENDIX 4: Qualifying species for indices of ecological continuity. Authorities for scientific names are given in Appendix 5.

Species	Score	IEC	RIEC	Species	Score	IEC	RIEC
<i>Agrilus pannonicus</i>	2	2	0	<i>Orchesia undulata</i>	3	1	1
<i>Ampedus elongantulus</i>	3	1	1	<i>Pediacus dermestoides</i>	3	1	1
<i>Ampedus quercicola</i>	1	3	3	<i>Phloiophilus edwardsii</i>	3	1	1
<i>Bitoma crenata</i>	3	1	1	<i>Phymatodes testaceus</i>	3	1	1
<i>Conopalpus testaceus</i>	3	1	1	<i>Platycis minutus</i>	3	1	1
<i>Cryptophagus micaceus</i>	1	3	3	<i>Prionychus ater</i>	3	1	1
<i>Eledona agricola</i>	3	1	1	<i>Pyrochroa coccinea</i>	3	1	1
<i>Enicmus rugosus</i>	2	2	2	<i>Quedius maurus</i>	3	1	1
<i>Eruoporicus caucasicus</i>	1	3	2	<i>Quedius scitus</i>	3	1	2
<i>Hallomenus binotatus</i>	3	1	1	<i>Rhizophagus nitidulus</i>	3	1	1
<i>Melandrya caraboides</i>	3	1	1	<i>Sinodendron cylindricum</i>	3	1	0
<i>Melasis bupestroides</i>	3	1	1	<i>Stenagostus rhombeus</i>	3	1	1
<i>Mycetophagus piceus</i>	3	1	2				
				TOTAL		33	31

APPENDIX 5: Coleoptera recorded in Great and Little Woods, Swanton Novers NNR at December 2009. NA = Notable A: NB = Notable B: NatN = Nationally Notable. * Qualifying saproxylic species.

Taxonomy follows *Checklist of the Beetles of the British Isles* ed. AG Duff (2008). For ease of reference families, and the species within each family, are listed in alphabetical order.

Anobiidae

- Grynobius planus* (Fab.) *
- Ptilinus pectinicornis* (L.) *

Apionidae

- Apion* (*Protapion*) *apricans* (Herbst.)
- A.* (*Protapion*) *assimile* (Kirby)
- A.* (*Ceratapion*) *carduorum* (Kirby)
- A.* (*Perapion*) *curtirostre* (Germar)
- A.* (*Protapion*) *fulvipes* (Geoff.)
- A.* (*Exapion*) *fuscirostre* (Fab.)
- A.* (*Omphalapion*) *hookerorum* (Kirby)
- A.* (*Perapion*) *hydrolapathi* (Marsh.)
- A.* (*Pirapion*) *immune* (Kirby)
- A.* (*Ischnopterapion*) *loti* Kirby
- A.* (*Kalcapion*) *pallipes* Kirby
- A.* (*Betulapion*) *simile* (Kirby)
- A.* (*Ulapion*) *ulicis* (Forster)
- A.* (*Perapion*) *violaceum* (Kirby)
- A.* (*Chlorapion*) *virens* (Herbst.)
- A.* (*Eutrichapion*) *vorax* (Herbst.)

Atellabidae

- Apoderus coryli* (L.)
- Attelabus nitens* (Scop.)

Bupestridae

- Agrilus cuprescens* (Menetries)
- Agrilus laticornis* (Illiger) * NB
- A. biguttatus* (Fab.)
- = *A. pannonicus* (Pill. & Mitt.)* NA

Byrrhidae

- Byrrhus pilula* L.
- B. pustulatus* (Forst.)

Byturidae

- Byturus ochraceus* (Scriba)
- B. tomentosus* (Degeer)

Cantharidae

- Cantharis cryptica* Ashe
- C. decipiens* Baudi
- C. livida* L.
- C. nigra* (Degeer)
- C. nigricans* (Muller)
- C. pallida* Goeze
- C. pellicuda* Fab.

C. rustica Fallen

- Malthinus flaveolus* (Herbst.) *
- Malthodes marginatus* (Latreille) *
- M. minimus* (L.) *
- Rhagonychia fulva* (Scop.)
- R. ignosa* (Mull.)
- R. limbata* Thomson
- = *R. femoralis* (Brulle)

Carabidae

- Abax parallelepipedus* (Pill. & Mitt.)
- Acupalpus dubius* Schilsky
- Agonum emarginatum* (Gyll.)
- A. fuliginosum* (Panzer)
- A. gracile* Sturm
- A. muelleri* (Herbst.)
- Amara aenea* (Degeer)
- A. eurynota* (Panzer)
- A. lunicollis* Schiodte
- A. nitida* Sturm NA
- A. ovata* (Fab.)
- A. plebeja* (Gyll.)
- A. similita* (Gyll.)

- Anchomenus dorsalis* (Pontoppidan)
Anthracus consputus (Duft.)
= *Acupalpus consputus* NB
Bembidion articulatum Panzer
B. dentellum (Thunb.)
B. doris (Panzer)
B. guttula (Fab.)
B. lampros (Herbst.)
B. mannerheimi Sahlberg
B. obtusum Serville
B. quadrimaculatum (L.)
B. tetracolum Say
B. varium (Oliv.)
Bradycellus harpalinus (Serville)
B. verbasci (Duft.)
Calathus rotundicollis Dejean
= *piceus* (Marsham)
Calodromius spilotus (Illiger)
= *Dromius quadrinotatus*
(Zenker in Panzer)
Carabus nemoralis Muller
C. violaceus L.
Chlaenius vestitus (Paykull)
Cicindela campestris L.
Curtonotus aulicus (Panzer)
= *Amara aulica* (Panzer)
Cychnus caraboides (L.)
Demetrius atricapillus (L.)
Elaphrus cupreus Duft.
E. riparius (L.)
Harpalus latus (L.)
H. smaragdinus (Duft.) NB
Leistus ferrugineus (L.)
L. fulvibarbis Dejean
L. spinibarbis (Fab.)
L. terminatus (Hellwig in Panzer)
= *L. rufescens* (Fab.)
Loricera pilicornis (Fab.)
Nebria brevicollis (Fab.)
N. salina Fairemaire & Laboulbene
Notiophilus biguttatus (Fab.)
N. palustris (Duft.)
N. rufipes (Strom.)
Ocys harpaloides (Audinet-Serville)
Oxytelus obscurus (Herbst)
= *Agonum obscurus* (Herbst)
Paradromius linearis (Olivier)
= *Dromius linearis* (Olivier)
P. quadrimaculatus (L.)
= *Dromius quadrimaculatus* (L.)
Paranchus albipes (Fab.)
= *Agonum pallipes* (Fab.)
Patrobus atrorufus (Strom.)
Philorhizus melanocephalus (Dejean)
= *Dromius melanocephalus* Degeer
Poecilus cupreus (L.)
P. versicolor (Sturm)
Pterostichus diligens (Sturm)
P. madidus (Fab.)
P. melanarius (Ill.)
P. niger (Schaller)
P. nigrita agg.
P. nigrita s.s. (Paykull)
P. strenuus (Panz.)
Stenolophus mixtus (Herbst.)
Trechus quadristriatus (Schrank.)
Cerambycidae
Agapanthia villosoviridescens
(Degeer)
Alosterna tabacicolor (Degeer) *
Arhopalus rusticus (L.)
Clytus arietis (L.) *
Grammoptera ruficornis (Fab.) *
Molorchus minor (L.)
Leiopus nebulosus (L.) *
Phymatodes testaceus (L.) *
Poecilium alni (L.) * NA
Pogonocherus hispidulus
(Pill. & Mitt.)
*
Pseudovadonia livida (Fab.)
= *Leptura livida* Fab.
Rhagium bifasciatum Fab. *
R. mordax (Degeer) *
Rutpela maculata (Poda.) *
Stenocorus meridianus (L.) *
Stenurella melanura (L.) *
= *Strangalia melanura* (L.)
Stictoleptura rubra (L.)
= *Leptura rubra* L.
Tetrops praeustus (L.) *
Cerylonidae
Cerylon ferrugineum Stephens *
C. histeroides (Fab.) *
Chrysomelidae
Altica brevicollis Foudras
A. palustris Weise
Aphthona euphorbiae (Schrank.)
A. nonstriata (Goeze)
Bruclidius villosus (Fab.)
Bruclius loti Paykull
B. rufimanus Boheman
Cassida rubiginosa Muller
C. vibex L.
C. viridis L.
Chaetocnema hortensis (Fourcroy)
Chrysolina coerulens (Scriba) [a]
C. hyperici (Forster)
C. polita (L.)
C. staphylaea (L.)
Crepidodera anrata (Marsh.)
= *Chalcoides aurata* (Marsh.)
C. aurea (Fourcroy)
= *Chalcoides aurea* (Fourcroy)
C. fulvicornis (Fab.)
= *Chalcoides fulvicornis* (Fab.)
Crioceris asparagi (L.)
Cryptocephalus pusillus Fab.
Donacia semicuprea Panzer
D. simplex (Fab.)
Epitrix pubescens (Koch.)
Galernella calvariensis (L.)
G. lineola (Fab.)
G. nymphaeae (L.)
G. tenella (L.)
Lema cyanella (L.)
Lochmaea capreae (L.)
L. suturalis (Thomson)
Longitarsus jacobaeae (Waterhouse)
L. parvulus (Paykull) NA
L. succineus (Foudras)
Luperus longicornis (Fab.)
Neocrepidodera transversa (Marsh.)
= *Crepidodera transversa* (Marsh.)
Oulema melanopus (L.) sens. strict.
Phaedon armoraciae (L.)
P. cochleariae (Fab.)
P. tumidulus (Germar)
Phratora vulgatissima (L.)
= *Phyllodecta vulgatissima* (L.)
Phyllotreta atra (Fab.)
P. nemorum (L.)
P. nigripes (Fab.)
P. tetrastigma (Comolli)
Prasocuris junci (Brahm.)
Psylliodes affinis (Payk.)
P. chrysocephala (L.)
P. dulcamarae (Koch)
Sphaeroderma rubidum (Graells)
Ciidae
Cis bilamellatus Wood
C. boleti (Scopoli) *
C. pygmaeus (Marsham) *
Ennearthron cornutum (Gyll.) *
Coccinellidae
Adalia 2-punctata (L.)
A. 10-punctata (L.)
Anatis ocellata (L.)
Aplidecta oblitterata (L.)
Calvia 14-guttata (L.)
Chilocorus bipustulatus (Stephens)
C. renipustulatus (Scriba)
Coccinella 7-punctata (L.)
Exochomus quadripustulatus (L.)
Halyzia 16-guttata (L.)
Harmonia axyridis (Pallas)
H. 4-punctata (Pont.)
Hippodamia variegata (Goeze)
= *Adonia variegata* (Goeze) NB
Myrrha 18-guttata L.
Propylea 14-punctata (L.)
Psyllobora 22-punctata (L.)
= *Thea 22-punctata* (L.)
Rhyzobius litura (Fab.)
Snbccoccinella 24-punctata (L.)
Tythaspis 16-punctata (L.)
Colydiidae
Bitoma crenata (Fab.) *
Cryptophagidae
Atomaria atricapilla Stephens
A. nigrostris Stephens
Cryptophagus micacens Rey* RDBK

<i>C. punctipennis</i>	<i>Neliocarus nebulosus</i> (Stephens)	<i>H. memmonius</i> Nicolai
Brisout de Barneville	<i>Orchestes pilosus</i> (Fab.)	<i>H. neglectus</i> Schaum NB
= <i>C. pilosus</i> Gyll.	<i>O. quercus</i> (L.)	<i>H. nigrita</i> (Fab.)
<i>Henoticus serratus</i> (Gyll.) *	<i>O. rusci</i> (Herbst.)	<i>H. palustris</i> (L.)
<i>Micranthe ulicis</i> (Stephens)	<i>Otiorynchus singularis</i> (L.)	<i>H. planus</i> (Fab.)
= <i>M. vini</i> (Panzer)	<i>O. sulcatus</i> (Fab.)	<i>H. pubescens</i> (Gyll.)
Cucujidae	<i>Parethelcus pollinarius</i> (Forst.)	<i>H. striola</i> (Gyll.)
<i>Pediacus dermestoides</i> (Fab.)*	= <i>Ceutorhynchus pollinarius</i> (Forst.)	<i>H. tessellatus</i> Drapiez
Curculionidae	<i>Phyllobius (Dieletus) argentatus</i> (L.)	<i>Hygrotus impressopunctatus</i>
<i>Amalorrhynchus melanarius</i>	<i>P. (Metaphyllobius) glaucus</i> (Scop.)	(Schaller)
(Stephens)	<i>P. (Nemoicus) oblongus</i> (L.)	<i>H. inaequalis</i> (Fab.)
<i>Audrion regeusteinense</i> (Herbst)	<i>P. (Metaphyllobius) pomaceus</i> Gyll.	<i>Hyphydrus ovatus</i> (L.)
= <i>Sitona regeusteinense</i> (Herbst)	<i>P. pyri</i> (L.)	<i>Ilybius ater</i> (Degeer)
<i>Anoplus plantaris</i> (Naezen)	<i>P. (Parnemoicus) roboretanus</i>	<i>I. chalconotus</i> (Panz.) NB
<i>Anthonomus bituberculatus</i>	Gredler	<i>I. fuliginosus</i> (Fab.)
Thomson	<i>P. (Parnemoicus) viridicollis</i> (Fab.)	<i>I. montanus</i> (Stephens)
<i>Archarius pyrrochoceras</i> Marsh.	<i>Polydrusus (Neoeustolus) cervinus</i>	<i>Laccophilus minutus</i> (L.)
<i>A. salicivorus</i> Payk.	(L.)	<i>Rhantus suturalis</i> (Macleay) NB
<i>Barynotus moerens</i> (Fab.)	<i>P. (Eurodrusus) confluens</i>	<i>Suphrodytes dorsalis</i> (Fab.)
<i>B. obscurus</i> (Fab.)	Stephens NB	Elateridae
<i>Barypeithes aranaeformis</i> (Schrank)	<i>P. (Eustolus) pterygomalis</i>	<i>Adrastus pallens</i> (Fab.)
<i>Ceutorhynchus constrictus</i>	Boheman	<i>Agriotes acuminatus</i> (Steph.)
(Marsh.) NB	<i>P. tereticollis</i> (Degeer)	<i>A. lineatus</i> (L.)
<i>C. contractus</i> (Marsham)	<i>Rauphus pulicarius</i> (Herbst.)	<i>A. obscurus</i> (L.)
= <i>C. minutus</i> (Reich.)	<i>Rhinoncus pericarpus</i> (L.)	<i>A. pallidulus</i> (Illiger)
<i>C. obstrictus</i> (Marsh.)	<i>Sciaphilus asperatus</i> (Bonsdorff)	<i>A. sputator</i> (L.)
= <i>C. assimilis sensu auct.</i>	<i>Sitona cylindricollis</i> (Fahraeus)	<i>Ampedus elongantulus</i> (Fab.) * NA
<i>C. pallidactylus</i> (Marsh.)	<i>S. humeralis</i> Stephens	<i>A. quercicola</i> (du Bysson) * NB
<i>Cionus scrophulariae</i> (L.)	<i>S. lepidus</i> Gyll.	<i>Aplotarsus incanus</i> (Gyll.)
<i>Coeliodes rana</i> (Fab.)	<i>S. lineatus</i> (L.)	= <i>Selatosomus incanus</i> (Gyll.)
= <i>C. dryados</i> (Gmelin)	<i>S. suturalis</i> Stephens	<i>Athous bicolor</i> (Goeze)
<i>Coeliodinus rubicundus</i> Herbst.	<i>Stenocarus ruficornis</i> (Stephens) NB	<i>A. haemorrhoidalis</i> (Fab.)
<i>Coelositona (Sitona) cambricus</i>	<i>Strophosoma capitatum</i> (Degeer)	<i>A. vittatus</i> (Fab.)
(Stephens)	<i>S. melanograunium</i> (Forster)	<i>Dalopius marginatus</i> (L.)
<i>Curculio glandium</i> Marsham	<i>Tachyerges salicis</i> (L.)	<i>Denticollis linearis</i> (L.) *
<i>C. nucum</i> L.	= <i>Rhynchaenus salicis</i> (L.)	<i>Hemicripidius hirtus</i> (Herbst.)
<i>C. venosus</i> (Grav.)	<i>Trichosirocalus troglodytes</i> (Fab.)	<i>Kibunea minuta</i> (L.)
<i>Datonychus melanostictus</i>	<i>Tychius picirostris</i> (Fab.)	<i>Melanotus castanipes</i> (Paykull)
(Marsham)	Scolytinae	<i>M. villosus</i> (Geoff.) *
<i>Dorytomus dejeani</i> Faust.	<i>Eruoporicus caucasicus</i> Lindemann*	<i>Stenagostus rhombeus</i> (Oliv.) *
<i>D. salicinus</i> (Gyll.) NB	= <i>Ernoporus caucasicus</i> Lindemann	Elmidae
<i>D. taeniatus</i> (Fab.)	RDB1	<i>Elmis aenea</i> (Muller)
<i>Drupenatus nasturtii</i> (Germar)	<i>Hylesinus crenatus</i> (Fab.) *	Endomychidae
<i>Graptus (Alophus) triguttatus</i> (Fab.)	<i>H. varius</i> (Fab.) *	<i>Endomychus coccineus</i> (L.) *
<i>Hylobius (Callirus) abietis</i> (L.)	<i>Scolytus intricatus</i> (Ratzeberg) *	Erotylidae
<i>Hypera nigrostris</i> (Fab.)	Dasytidae	<i>Dacne bipustulata</i> (Thunberg) *
<i>H. postica</i> (Gyll.)	<i>Dasytes aeratus</i> Stephens*	<i>D. rufifrons</i> (Fab.) *
<i>H. (Eirromorphus) rumicis</i> (L.)	Dytiscidae	<i>Triplax russica</i> (L.) *
<i>H. (Antidonus) zoilus</i> (Scopoli)	<i>Acilius sulcatus</i> (L.)	Eucnemidae
= <i>H. punctata</i> (Fab.)	<i>Agabus bipustulatus</i> (L.)	<i>Melasis bupestoides</i> (L.) * NB
<i>Leisoua deflexum</i> (Panz.)	<i>A. didymus</i> (Olivier)	Geotrupidae
<i>Lophloeus tessulatus</i> (Muller)	<i>A. guttatus</i> (Paykull)	<i>Typhaeus typhoeus</i> (L.)
<i>Magdalis carbonaria</i> (L.) * NB	<i>A. nebulosus</i> (Forster)	Gyrinidae
<i>M. cerasi</i> (L.) * NB	<i>A. sturui</i> (Gyll.)	<i>Gyrinus substriatus</i> Stephens
<i>Mecinus pascuorum</i> (Gyll.)	<i>Colymbetes fuscus</i> (L.)	Haliplidae
<i>Micrelus ericae</i> (Gyll.)	<i>Dytiscus marginalis</i> L.	<i>Haliplus confinis</i> Stephens
<i>Microploutus campestris</i> (Gyll.)	<i>Hydroporus angustatus</i> Sturm	<i>H. lineatocollis</i> (Marsh.)
<i>M. rugulosus</i> (Herbst.)	<i>H. erythrocephalus</i> (L.)	<i>H. ruficollis</i> (Degeer)
<i>Mogulones asperifoliarum</i> (Gyll.)	<i>H. gyllenhalii</i> Schiodte	Helophoridae
<i>Nedyus quadrimaculatus</i> (L.)	<i>H. incognitus</i> Sharp	<i>Helophorus brevipalpis</i> Bedel
= <i>Cidnorhinus quadrimaculatus</i> (L.)	<i>H. melanarius</i> Sturm	<i>H. minutus</i> Fab.



Left: Dr Martin Rezjek (left) with the author inspecting the re-pollarding, April 2009.

Photo: Beccy Rezjek.

Below: Compartment 15, coppiced in winter 2008–2009, photographed on 6 April 2009.

Photo: Bryan Sage.



Below: Ride 61 from the west, photographed on 11 May 2010.

Bottom: Ride 61 from the west, photographed on 8 November 2009. Photos: Bryan Sage.



Above: Carstone surfacing on north edge of Compartment 20, photographed on 11 May 2010. Photo: Bryan Sage.



- H. obscurus* Mulsant
- Histeridae**
Atholus duodecemstriatus (Schrank)
Baeckmauniolus dimidiatus (Ill.) NB
Dendrophilus punctatus (Hbst.)
Gnathoncus nanmetensis (Morseul)
Hister unicolor L.
Margarinotus brunneus (Fab.)
= *Hister impressus* (Fab.)
M. merdarius (Hoffmann)
M. ventralis (Marseul)
Onthophilus striatus (Forster)
- Hydraenidae**
Octhebius miuimus (Fab.)
Hydraeua testacea Curtis NB
- Hydrophilidae**
Anacaena bipustulata (Marsh.) NB
A. globulus (Payk.)
A. lutescens (Stephens)
Cercyon lateralis (Marsh.)
C. sternalis Sharp NB
Helochares lividus (Forster) NB
Hydrobius fuscipes (L.)
Laccobius bipunctatus (Fab.)
L. colon (Stephens)
= *L. biguttatus* Gerhardt.
L. miuutus (L.)
L. striatulus (Fab.)
Megasternum coucinuum (Marsh.)
= *M. obscurum* (Marsh.)
Sphaeridium luuatum Fab.
- Hygrobiidae**
Hygrobia herrmanni (Fab.)
- Kateretidae**
Brachypterus glaber (Newman)
B. urticae (Fab.)
- Lampyridae**
Lampyrus noctiluca (L.)
- Latridiidae**
Cartodere (Aridius) nodifer
(Westwood)
Corticaria umbicilata (Beck)
Corticaria gibbosa (Herbst.)
Enicmus rugosus (Herbst.) * NB
Stephostethus lardarius (Degeer)
- Leiodiidae**
Agathidium uigrinum Sturm *
Amphicyllis globus (Fab.)
Anisotoma humeralis (Fab.) *
Catops chrysomeloides (Panzer).
C. fuliginosus Erichson
C. grandicollis Erichson
C. nigricans (Spence)
C. nigrita Erichson
Colenis immunda (Sturm.)
Nargus wilkini (Spence)
Sciodrepoides fumata (Spence)
S. watsoni (Spence)
- Lucanidae**
Dorcus parallelipedus (L.) *
Sinodendron cylindricum (L.) *
- Lycidae**
Platycis miuutus (Fab.) * NB
- Malachiidae**
Malachius bipustulatus (L.) *
- Melandryidae**
Conopalpus testaceus (Ol.) * NB
Melandrya caraboides (L.) * NB
Orchesia undulata Kraatz *
- Monotomidae**
Rhizophagus bipustulatus (Fab.) *
R. dispar (Payk.) *
R. fenestratus (L.)
= *R. parvulus* (Payk.) *
R. nitidulus (Fab.) * NB
- Mycetophagidae**
Mycetophagus multipunctatus Fab.* NB
M. piceus (Fab.)* NB
M. quadripustulatus (L.) *
- Nitidulidae**
Cryptarcha strigata (Fab.) * NB
Cychramus luteus (Fab.)
Epuraea aestiva (L.)
E. biguttata (Thunberg) *
= *E. unicolor* (Olivier)
E. distincta (Grimmer) * NA
E. melanocephala (Marsh.)
E. marseuli Reitter *
E. silacea (Herbst) *
Glischrochilus hortensis (Fourcroy)
Kateretes rufilabris (Latr.)
Meligethes aeneus (Fab.)
M. atramentarius Forster
M. atratus (Ol.)
M. brunnicornis Sturm.
M. carinulatus Forster
M. nigrescens Stephens
M. ruficornis (Marsh.)
Soronia punctatissima (Ill.) *
- Oedemeridae**
Oedemera lurida (Marsh.)
O. virescens (L.) * RDB3
- Phalacridae**
Olibrus corticalis (Panz.)
Stilbus testaceus (Panz.)
- Phloiophilidae**
Phloiophilus edwardsii Stephens *NB
- Ptilidae**
Acrotichis intermedia (Gillmeister)
Ptenidium nitidum (Heer)
- Pyrochroidae**
Pyrochroa serraticornis (Scopoli) *
- Rhynchitidae**
Caenorhinus mannerheimi
(Hummel)
= *Deporaus mannerheimi* (Hummel)
Deporaus betulae (L.)
Neoconorrhinus aeneovirens
(Marsh.)
= *Rhynchites aeneovirens* (Marsh.)
N. aequatus (L.)
= *Rhynchites aequatus* (L.)
- N. germanicus* Herbst.
= *Rhynchites germanicus* Herbst
Temnocerus longiceps Thomson NB
T. nanus (Payk.)
Salpingus planirostris (Fab.) *
= *Rhinosisimus planirostris* (Fab.)
- Scarabaeidae**
Amphimallon solstitiale (L.)
Aphodius fossor (L.)
A. rufipes (L.)
A. sphacelatus (Panzer)
Melolontha melolontha (L.)
Serica brunnea (L.)
- Scirtidae**
Cyphon coarctatus Payk.
C. ochraceus Stephens
C. padi (L.)
C. variabilis (Thunberg)
Elodes minuta (L.)
Microcara testacea (L.)
- Scraptiidae**
Anaspis fasciata (Forster) *
= *A. humeralis* (Fab.)
A. frontalis (L.) *
A. lurida Stephens *
A. maculata Fourcroy
A. pulicaria Costa, A. *
A. regimbarti Schilsky
A. rufilabris (Gyll.) *
- Scydmaenidae**
Neurathes elougatulus
(Muller & Kunze)
Stenichmus scutellaris
(Muller & Kunze)
- Silphidae**
Dendroxena quadrimaculata
(Scopoli) NB
Necrodes littoralis (L.) NB
Nicrophorus humator (Gleditsch)
N. investigator Zett.
N. vespillo (L.)
N. vespilloides Herbst.
Oiceoptoma thoracicum (L.)
Silpha atrata L.
Thanatophilus rugosus (L.)
- Sylvanidae**
Silvanus unidentatus (Olivier)
- Sphindidae**
Aspidophorus orbiculatus (Gyll.) *
- Staphylinidae**
Aleochara sparsa Heer
Anotylus inustus (Grav.)
A. rugosus (Fab.)
A. sculpturatus (Grav.)
Anthobium atrocephalum (Gyll.)
A. unicolor (Marsh.)
Atheta castanoptera (Mannerheim)
A. pilicornis (Thomson) NatN
A. triangulum (Kraatz)
Autalia impressa (Ol.)
A. longicornis Scheerpeltz

- Bisnius sordidus* (Grav.)
= *Philonthus sordidus* (Grav.)
- Bolitobius cingulatus* (Marm.)
- Bolitochara obliqua* Erichson
- Coryphium angusticolle* Stephens *
- Creophilus maxillosus* (L.)
- Drusilla canaliculata* (Fab.)
- Eusthaleruum luteum* (Marsh.)
- Gabrius splendidulus* (Grav.) *
- Geostiba circellaris* (Gravenhorst)
- Gyrohypnus angustatus* (Stephens)
- Gyrophæna lucidula* Erichson***NatN**
- Hapalarea pygmaea* (Payk.) *
- Haploglossa villosula* Stephens
- Ischnosoma splendidum* (Grav.)
- Lathrobium brunnipes* (Fab.)
- L. elongatum* (L.)
- L. fulvipenne* (Grav.)
- Liogluta longiuscula* (Grav.)
- Lithocharis ochracea* (Grav.)
- Lordithon lunulatus* (L.)
- L. trinotatus* (Erichson)
- Metopsia clypeata* (Muller)
= *Metopsia retusa* (Stephens)
- Microdota amicula* (Stephens)
- Mocyta amplicollis* (Mulsant & Rey)
- M. fungi* (Gravenhorst)
- Mycetoporus lepidus* (Grav.)
- M. flongicornis* Maklin **NB**
- Myllaena brevicornis* (Matthews)
- Ocypus (Pseudocypus) aeneocephalus* (Degeer)
- O. (Matidus) brunnipes* (Fab.)
- O. olens* (Muller, O.F.)
- Oligota inflata* (Mannerheim)
- O. parva* Kraatz
- O. pumilio* Kieserwetter
- O. punctulata* Heer
- Olophrum fuscum* (Grav.)
- O. piceum* (Gyll.)
- Omalium allardii*
Fairmaire & Brisout **NB**
- O. rivulare* (Payk.)
- Ontholestes murinus* (L.)
- O. tessellatus* (Geoff.)
- Othius angustus* Stephens
- O. laeviusculus* Stephens
- O. punctulatus* (Stephens)
- O. subuliformis* Stephens
- Oxypoda acuminata* (Stephens)
- O. alternans* (Gravenhorst)
- O. opaca* (Gravenhorst)
- Philonthus addendus* Sharp
- P. carbonarius* (Grav.)
= *P. varius* (Gyll.)
- P. cognatus* Stephens
- P. decorus* (Grav.)
- P. marginatus* (Strom.)
- P. manuerheimi* Fauvel
- P. politus* (L.)
- P. quisquiliarius* (Gyll.)
- P. splendens* (Fab.)
- P. succicola* Thomson
- P. tenuicornis* Muls. & Rey
- P. umbratilis* (Grav.)
- P. varians* (Paykull)
- Philorinum sordidum* (Steph.)
- Phloeostiba plana* (Paykull) *
- Platarea brunnea* (Fab.)
- Platydracus stercorarius* (Ol.)
- Proteinus brachypterus* (Fab.)
- Quedius cruentus* (Ol.)
- Q. curtipennis* Bernh.
- Q. fuliginosus* (Grav.)
- Q. (Microsaurus) lateralis* (Grav.)
- Q. (Raphirus) maurorufus* (Grav.)
- Q. (Microsaurus) maurus*
(Sahlberg)*
- Q. (Microsaurus) mesomelinus*
(Marsh.)
- Q. molochinus* (Gravenhorst)
- Q. (Microsaurus) scitus*
(Grav.) * **NB**
- Rugilus erichsoni* (Fauvel)
- R. rufipes* Germar
- Sepedophilus marshami* (Stephens)
- S. uigripenis* (Stephens)
- Stenus (Hemistenus) aceris* Stephens
- S. bimaculatus* Gyll.
- S. (Tesus) brunnipes* Stephens
- S. (Hypostenus) cicindeloides*
(Schaller)
- S. clavicornis* (Scop.)
- S. (Metastenus) flavipes* Stephens
- S. (Hemistenus) impressus* Germar
- S. (Hemistenus) latifrons* Erichson
- S. (Metastenus) nitidiusculus*
Stephens
- S. (Hemistenus) pallipes* Gravenhorst
- S. (Metastenus) pallitarsis* Stephens
- S. (Metastenus) picipennis* Erichson
- S. (Metastenus) picipes* Stephens
- S. providus* Erichson
- S. (Hypostenus) similis* (Herbst.)
- S. (Hypostenus) tarsalis* Ljungh
- Tachinus humeralis* Grav.
- T. pallipes* (Grav.)
- T. proximus* Kraatz
- T. rufipes* (L.) = *T. signatus* Grav.
- T. subterraneus* (L.)
- Tachyporus atriceps* Stephens
- T. chrysomelinus* (L.)
- T. dispar* (Paykull)
- T. hypnorum* (Fab.)
- T. obtusus* (L.)
- T. pallidus* Sharp
- T. pusillus* Grav.
- T. solutus* Erichson
- Tasgius morsitans* (Rossi)
= *Ocypus compressus* Marsh.
- T. globulifer* (Geoff.)
- Thamiaraea cinuamomea* (Grav.) *
- Xantholinus linearis* (Ol.)
- X. longiventris* Heer
- Xylodromus depressus* (Grav.)
- Pselaphinae**
- Bryaxis bulbifer* (Reichenbach)
- B. puncticollis* (Denny)
- Rybaxis longicornis* (Leach)
- Tychus niger* (Paykull)
- Scaphidiinae**
- Scaphidium quadrimaculatum* Ol. *
- Scaphisoma boleti* (Panzer) *
- Tenebrionidae**
- Diaperis boleti* (L.) * **RDB2**
- Eledona agricola* (Herbst.) * **NB**
- Isomira murina* (L.)
- Lagria hirta* (L.)
- Prionychus ater* (Fab.) * **NB**
- Tenebrio molitor* (Fab.)
- Tetratomidae**
- Hallomenus binotatus* (Quensel)***NB**
- Throscidae**
- Trixagus dermestoides* (L.)



Leucocoprinus meleagris Two large groups of over 50 fruitbodies were found at Foxley Wood on a large pile of year-old woodchips which had considerable underlying warmth when the top layer was excavated. The fungus discoloured and blackened on handling, as is typical for the genus. *Photo:* Jonathan Revett.



Allopsalliota geesterani This specimen collected at Whitlingham Broad by Michelle Hoare in October 2009 was the second UK record for this robust mushroom. *Photo:* Tony Leech.



Lepiota ignivolvata Characterised by relatively large size, rings with a dark edge, slowly reddening stem-base and a preference for growing in soil with underlying chalk or limestone. These specimens were found at Two Mile Bottom, near Thetford. *Photo:* Jonathan Revett.



Keith Clarke on his 81st birthday. *Photo:* Michael Clarke.



Ken Durrant on Beeston Common, July 2004. *Photo:* Janet Negal.

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Dick Hamond on his boat *Orion* at Morston Quay. *Photo:* Don Dorling.



Scirpus sylvaticus Wood Club-rush

The first recorded Norfolk sighting of this plant since the early years of the 19th century

Gillian Beckett

On 25 June 2010, Hatty Aldridge, botanising on Derby Fen, Grimston, with members of the Norfolk Flora Group, spotted two colonies of *Scirpus sylvaticus* Wood Club-rush growing on the opposite bank of the Gaywood River. Mike Padfield nobly waded across and collected a piece so that the identification could be confirmed and also to provide a specimen for the county's herbarium in the Shirehall at the Castle Museum. When examined by other members of the group, no one had any doubt as to the plant's identity and this was also confirmed when Alec Bull joined them whilst visiting the area to check the Rubi (brambles). See p. 152 for photographs.

Two colonies were seen, the first occupied about a metre of the river bank, while the second was slightly more extensive, extending over about two metres of bank. In both colonies over 25 individual flowering heads were counted, but there were probably more: to have attempted a complete count would have involved trampling the surrounding vegetation to an unacceptable degree. At this point the river bottom consists of mud of varying depth, over gravel. Several metres downstream there is a purely gravel riffle. Most of the plants seemed rooted on the lower parts of the bank, presumably where ground water was seeping into the channel. In the first colony, however, there were obvious leaf rosettes growing on top of the bank where conditions were plainly somewhat drier. The dominant companion to the *Scirpus* was *Carex rostrata* Bottle Sedge, with some *Phalaris arundinacea* Reed Canary-grass and *Iris pseudacorus* Yellow Iris. Much smaller quantities of *Rorippa nasturtium-aquaticum* Watercress and *Caltha palustris* Marsh-marigold were

also present. The other bank of the river was dominated by *Carex rostrata*, *Glyceria maxima* Reed Sweet-grass, *Typha latifolia* Bulrush and smaller quantities of plants such as *Lycopus europaeus* Gypsywort and *Scrophularia auriculata* Water Figwort. The riverbanks, both upstream and downstream, were examined carefully for any other colonies, but none were seen. A wide range of aquatic and semi-aquatic plants were, however, present.

Wood Club-rush is a plant of marshes, moist places in woods and the edges of ditches and streams. Local in occurrence, its nearest sites are in eastern Suffolk and Essex, but in most areas its numbers are much reduced, largely because of a change of habitat through the use of machinery and the consequent deeper dredging of small rivers and streams. In this area, the Gaywood River has been straightened and deepened for the benefit of arable farming in several phases over the last 150 years. This has more or less canalised the river and greatly reduced the natural history interest of an area that was formerly very rich in many forms of wildlife. About ten years ago, however, the Gaywood River restoration project began as a joint initiative by English Nature, the King's Lynn Consortium of Internal Drainage Boards and the Rural Development Service. Between 2002 and 2004 meanders were put in the course of the river and a number of land drains were filled, the aim being to restore the river to its original natural course. A programme of restoration works on the adjacent three SSSI Fens (Sugar, Derby and Leziate) were also instigated at the same time and has continued to this day. All this suggests that the seed of Wood Club-rush had lain dor-

mant for many years and it been brought to light by the work done.

The first Norfolk record was made in about 1800 at Belsey Bridge, Ditchingham by Thomas Jenkinson Woodward. He annotated his copy of Hudson's 1778 *Flora Anglica* with the record. Further records were made in the 19th century at Weybread, Syleham and Mendham, all on the Suffolk county boundary and reported to FW Galpin who published them in his *Flowers of the Harleston Area* in 1888. Since that date the species has not been recorded in the county. Interestingly, although the recent *Flora of Suffolk* (2010) lists a number of current sites in Suffolk, the Waveney Valley, where all the above were located, does not feature.

It is almost certain that it did grow at one time in West Norfolk. The lack of early records is very likely to be because the botanists and collectors of the late 18th and early 19th centuries were mostly Norwich men of whom few had the time and energy to make the long journey to the Lynn area in order to search new and relatively unknown sites. They could obtain most of the wetland specimens they wanted from the bogs of St Faith's and Horsford, or from the Broadland marshes, all close at hand, well documented and easy. By the arrival in the late 19th and 20th centuries of more local botanists the plant was almost certainly no longer present.

What is wanted today is for some determined botanists to search other suitable habitats in the county, especially those that remain in the Waveney area, to see if the plant can be re-found elsewhere.

Many thanks are due to Frances Schumann and Robin Stevenson of the Flora Group who were present at this discovery and sent me details of the find and some relevant facts concerning it; to Ash Murray, Natural England's Senior Reserve Manager for information about the Gaywood River Project and also to Robin who revisited

the site later and took the excellent photographs.

G Beckett Bramley Cottage, Stanhoe, King's Lynn, Norfolk PE31 8QF



Wood Club-rush *Scirpus sylvaticus* at Derby Fen, Grimston. See p.150. *Photos: Robin Stevenson.*



Myrmica karavajevi. A workerless ant new to Norfolk and Suffolk. See p.153. *Photo: Doreen Wells.*

Myrmica karavajevi ((Arnoldi 1930) Formicidae: Myrmicinae) a rare ant new to Norfolk and Suffolk

Doreen Wells

Myrmica karavajevi is a very rare workerless social parasitic ant, which has now been identified from five forest ride sites in both the Norfolk and Suffolk parts of Thetford Forest. A photograph of the dealate queen found in Norfolk is shown on p.152: note the characteristic projection on the post-petiole and the flattened hairs on the first gaster segment. For further identification features see Radchenko *et al.* 2003.

The ant was identified by me from pitfall samples collected in August 2009 by Scott Pedley, who is carrying out research for a PhD with the School of Environmental Sciences at the University of East Anglia, examining the effects of experimental disturbance treatments on ground active invertebrates, particularly spiders. This work is part of a collaborative experiment with the Forestry Commission.

On the 20 January 2010, I was excited to find the first specimen of a dealate queen from a Norfolk site and Mike Fox (BWARS) very kindly confirmed my determination. In the following weeks, as I processed and identified the ant samples from other forest rides, seven more *Myrmica karavajevi* specimens were recorded, bringing the total to eight specimens from five sites. The records are from three distinct areas which would indicate that there is a healthy population of this species in Thetford Forest.

This is a first for East Anglia and these records provide the most northerly and easterly records for this species in Britain (Fox 2010 pers. comm.). Until recently, as Mike Fox points out in his profile, there were only a few British records, all from southern counties, namely Dorset, Hampshire, Kent, Surrey and Pembrokeshire,

mostly from heaths and commons, but it has also been recorded from NW, Central, Eastern and Northern Europe to 63 degrees North (Fox 2010).

The host ant species for this parasite in Britain are *Myrmica scabrinodis* and *Myrmica sabuleti* and data from the pitfall samples indicate that one or both species are present in good numbers on the forest rides sampled in Thetford Forest. This is extremely important for the spread of *Myrmica karavajevi*.

M. karavajevi appears to prefer habitats which are warm and damp such as heaths, meadows, forest rides or clearings, as well as wet places such as bogs and marshes. *M. scabrinodis* is to be found nesting in all of the above habitats, with *M. sabuleti* having a preference for nesting in calcareous grassland, warm sandy heaths and forest rides in Britain.

Social parasitism in ants is a relationship in which one species of ant (the parasite) lives at the expense of another species (the host); the parasitic species usually does not participate in gathering food or caring for the young. With more than 200 known species of parasitic ant worldwide, many show great complexity in their social organisation (Hölldobler *et al.* 1990).

M. karavajevi is a particular type of social parasite known as an inquiline, or permanent workerless social parasite. After her mating flight, the queen searches for a nest of a host *Myrmica* species. This she enters, and if accepted by the workers she lives alongside the host queen(s). Her role becomes a primary one, as she produces the only sexuals (males and queens) of the colony, with the host queen reduced to pro-

ducing only workers. Her supremacy over the host queen seems all the more amazing because she is much smaller than the host queen, being about the same size (3.5 mm) or slightly smaller than the workers. Unfortunately, there is little biological data about the relationship between *M. karavajevi* and its host species, so the specific form of social organisation is little understood. It is thought, however, that chemical pheromones are probably responsible for the success of social parasites in gaining access to the host colony (Hölldobler *et al.* 1990); they mimic the host species.

Now we have discovered this species in Norfolk, I have the opportunity to undertake future research which will, hopefully, identify specific host nest sites, so that we can learn more about this species, including its host and habitat preferences.

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DEH Wells 1 Cobden Terrace, Northgate Street, Great Yarmouth, NR30 1BT.

Weather Report 2009

Norman Brooks

Observations were made with approved Meteorological Office instrumentation, and in accordance with standard Meteorological Office practice, at Old Costessey, Norfolk. Monthly figures are presented in Table 1.

Monthly accounts

January 2009 With a mean temperature of 2.8°C, the month was more than 4°C colder than the abnormally warm January of 2008. It was the coldest January since 1997 and its highest maximum (9.3°C) was exceeded on 20 days in January 2008.

Only five nights escaped ground frost and snow was observed on the 4 and 5 January with a thin covering briefly persisting on 5 January.

February 2009 Cold until mid-month, then much milder and frost-free in the second half. In the first half of the month the mean

maximum temperature was 4.3°C and the mean minimum temperature was -1.6°C. In the second half these figures were 10.0°C, and 4.4°C respectively.

Soil temperature at 10 cm depth is of particular importance for plant growth: in the first half of the month the mean soil temperature was 1.5°C but this rose to 5.5°C in the second half allowing spring growth to resume without interruption.

Sleet or snow fell on nine days and lay thinly for four. On 21 February there was a display of the dramatic altocumulus lenticularis cloud formation, rarely observed from the flatlands of East Anglia.

March 2009 An almost complete absence of winds between north and east allowed the average temperature for the month to be above normal due to high day maxima. Frequent clear nights allowed ground frosts

Table 1 Monthly summaries for 2009

Month	Total rainfall (mm)	Percentage of mean rainfall	Days air frost	Days ground frost	Monthly mean temperature (°C)	Deviation from mean (°C)
January	45.4	78%	11	26	2.8	-1.2
February	52.1	122%	11	16	4.3	+0.5
March	46.9	97%	7	19	6.8	+0.9
April	23.6	52%	1	6	10.8	+3.2
May	39.9	88%	0	1	13.1	+1.8
June	70.3	131%	0	0	15.2	+0.8
July	85.0	151%	0	0	17.3	+0.8
August	15.0	29%	0	0	18.5	+2.1
September	15.4	28%	0	0	15.3	+1.0
October	56.5	97%	0	0	11.5	+0.5
November	115.1	164%	0	5	8.8	+2.1
December	95.3	156%	17	20	3.4	-1.4

to develop with above-average frequency.

Sleet was observed on 24 and 28 March, and on 21 March the temperature rose from a minimum of -3.0°C at around 0400 hours to a balmy 15.0°C in the early afternoon.

April 2009 Unusually mild but not as warm as April 2007. The month almost escaped air frost with the lowest minimum -0.1°C on 1 April. It was a dry month with over half the rainfall total falling on 11 April when 15.6 mm was recorded.

May 2009 Warm, with marginally below-average rainfall. Unusually for May it was often quite windy but seldom from the north-easterly quarter. The combination of strong spring sunshine and drying winds caused the countryside to become parched by the end of the month.

June 2009 Heavy thundery rain on 15 and 18 of June boosted the monthly rainfall to 131% of the average.

A very violent hailstorm battered parts of Central Norfolk on 15 June. Carbrooke, near Watton, bore the brunt of the storm with hailstones accumulating in places to a depth of over 15 cm. Drifts of ice were still visible on 16 June despite the warm weather. Precipitation at Carbrooke was 104 mm, at Watton 33 mm, Morely St. Botolph 33 mm and at Old Costessey 24.6 mm. Along the track of the storm there was considerable damage to crops with the kernels of malting barley being literally stripped from their stalks by the hail.

July 2009 Rain fall on 21 days yielding a monthly rainfall total 50% in excess of the average. The lush growth and green countryside bore testimony to a damp summer month. Although thunder was heard on seven days, all the storms were slight and transitory.

August 2009 The warmest August since 2003 and notably dry with even trees showing signs of drought-related stress by the close of the month. Day temperatures re-

mained well above normal throughout the month; only three failed to exceed 21°C and thirteen reached or exceeded 25°C .

September 2009 Exceptionally dry with rainfall barely a quarter of the long-term average. Most of the month's rain fell on 2 September when 12.1 mm was measured. The balance of a mere 3.3 mm for the rest of the month caused the countryside to assume an almost Spanish degree of aridity.

October 2009 A quiet and benign month devoid of gales and air frosts but with less sunshine than usual. Two funnel clouds were observed on 1 October to the east and northeast of Calthorpe.

November 2009 The rainfall deficit of 73 mm during August and September was significantly reduced by the rainfall excess of 45 mm during November, the wettest since 1996. Rain was recorded on 23 days during this dismal and sodden month which had an average temperature of 2.1°C above normal, making it the mildest November since 1994.

The month passed without a single air frost, concluding a lengthy period (2 April to 30 November) during which the air temperature never dropped below zero.

December 2009 With a mean temperature down to 3.4°C the contrast with the previous month was dramatic. The average decrease in temperature from November to December is 1.9°C but this year it was 5.4°C .

December was a wet month with snow falling on eight days and lying from 18 to 25 December inclusive, with a cumulative depth of 11 cm. On 29 December glazed ice formed when 1.0 mm of rain fell on frozen surfaces and turned immediately into ice to create skating-rink conditions.

Annual summary 2009

Total rainfall	660.5 mm
	102% of mean
Wettest day	15 June, 24.6 mm

Days with rain recorded	177
Days with sleet or snow	21
Days with snow lying	13
Highest maximum temperature	28.9°C
	19 August
Lowest maximum temperature	0.4°C
	20 and 22 December
Highest minimum temperature	17.0°C
	28 June
Lowest minimum temperature	-7.0°C
	6 January
Lowest grass minimum temperature	-9.6°C
	6 January
Air frosts	47
Ground frosts	96
Days with gales	1
	18 November
Days with thunder	15
Longest period with no measurable rain	
	14 days (15-29 September inclusive)
Days with hail	6
Days with fog (09.00 hrs)	7
Mean cloud cover at 09.00 hrs	65%
Wind direction at 09.00 hrs (days):	
North	17
North-east	29
East	21
South-east	28
South	27
South-west	79
West	61
North-west	52
Calm	51
Annual mean maximum temp.	14.8°C
Annual mean minimum temp.	6.5°C
Annual mean temperature	10.7°C

N Brooks *Fellow Royal Met. Soc.*
1 The Croft, Old Costessey, Norwich
NR8 5DT

Butterflies

Andy Brazil

Overall 2009 was a better year for butterflies than the two previous years and produced some interesting records. The year will obviously be remembered for the Painted Lady migration, a spectacular event for those who caught it, but it was also notable for records of hairstreaks, with many new sites being reported.

Species accounts

Nearly all species showed some improvement in numbers, the exception being Red Admiral, which declined noticeably, and Holly Blue, which appears to have declined slightly. Where dates are given, the equivalents for 2008 are added in parentheses. I have noted, for all except those of 'Least Concern', the status given in the 2010 Red Book (Fox *et al.* 2010). It is sobering to reflect that, of the species historically present in Norfolk, 23% are now extinct and 23% are of conservation concern.

Dingy Skipper (Vulnerable)

Surveys produced six new tetrads, and confirmed its presence in a further ten, which is an improvement – but this comprises slightly under half of the historic sites. While the normal flight period ran from 29 April till 29 May (7 May-31 May), with 12 June an outlier, a single sighting on 20 July suggests a partial second brood. It is interesting to speculate whether the relative lack of such reports historically is genuine or simply down to observers not looking for the insect (or visiting the sites) in late July/early August. The highest number reported was 20 (5) from Narborough.

Grizzled Skipper (Vulnerable)

Following extensive survey work during the year the situation is much improved. Two new colonies have been discovered

along the cut-off channel and the species confirmed present in a further 11 tetrads. This, however, still leaves it occupying just over half of its historic range and it continues to give grounds for concern. The main flight period was 24 April to 31 May (3 May-21 May), with a sighting on 24 June an outlier. The highest count was 20 (10) from the cut-off channel, with many other counts above 15 suggesting a good year.

Swallowtail (Near Threatened)

Sightings were pretty much continuous from 15 May till 31 July (20 May-3 August): A single report on 29 April and one on 8th August were exceptions. Sightings were mostly confined to the core broads, with only two reports outside (Burgh Apton and East Ruston). This suggests that there was little pressure for males to wander, implying a relatively low population density. Anecdotally it certainly seemed like an average to poor year. The highest count was 11 (15) from Hickling.

Clouded Yellow

Recorded from 34 tetrads, a considerable increase on last year (2). Seen 28 May-12 June, 23 July-23 August and then 13 September-25 October. Although there is a natural bias towards the coast (66% of sightings), some sightings came from the Brecks – implying that they flew through a lot of places unobserved. Hempton Marsh produced 30 plus on 9 August, the largest count since the invasion of 1996.

Green Hairstreak

The main flight period was 19 April to 12 June (2 May-14 June): A single sighting on 23 July (TB) was the only hint of a second brood – again, was anybody looking? Although relatively few new sites were discovered, numbers were slightly up:

the maximum count was 14 (8) from Scolt Head. The colony at Mousehold Heath, Norwich had an excellent year, spreading across Gurney Road to the eastern side of the heath. A single sighting on the Marriotts Way at Costessey hints that the former colony within the Norwich Golf Club may still exist – does anyone play golf there?

Brown Hairstreak

A single caterpillar on Blackthorn photographed in the county appears to be this species, which has only been recorded in Norfolk once before, in the 1870s. The recent sighting is not an improbable distance from the location of that record. Despite searches, however, no adults were observed during the flight season. Investigations continue.

Purple Hairstreak

This has to be the most under-recorded butterfly in Norfolk. In 2009 colonies did very well, making them easier to spot. An illustration of both points is that by driving round and looking at suitable oak trees one recorder (DL Cheyne) found it in every one of 11 adjacent tetrads. The flight period was 24 June to 22 August (5 July-29 August): both the earliest and latest dates were outliers. A colony was discovered in the oak in the centre of the car park at Zak's restaurant at Mousehold – conveniently so as it was being used as the designated assembly point for a public butterfly walk at the time. This was one of three colonies seen on the heath. The highest count was 30 plus from TG4220.

White-letter Hairstreak (Endangered)

The flight period was 26 June to 25 July (1 July-3 August). Diligent searching for eggs and larvae has further increased the known distribution, and it is now recorded from 55% of the county's 10km squares. The fine elm in Chapelfield Gardens in Norwich had been suspected of harbouring a colony (an egg was seen in 2007) and flying adults were finally seen this year. One recorder was fortunate enough to have one land on

her washing line in Ditchingham. Middlesex managed to get this year's oddest record however: a sharp-eyed viewer spotted one on TV during a Venus Williams match at Wimbledon.

Brown Argus

First 6 May, last 8 October (10 May-14 September), highest count 87 (12) from Terrington St. Clement. Many counts of 20 plus indicate how good a year it was for this species. In the coming season researchers from UEA will be working on this species (and Common Blue) in the Brecks, employing markings on the underside of the wings. Anyone spotting insects with brightly coloured felt-tip dots on the underwing is asked to note both the colour and pattern of the dots and to submit this data with their records.

Chalkhill Blue

First seen at Warham Camp on 28 July by a Butterfly Conservation party (1 August) and last seen on 25 August. The highest count was 25 (10). The fact that early sightings were of males, with females emerging later, suggests that these insects emerged naturally, and not from a cardboard box – although 'top-ups' cannot be ruled out.

White Admiral (Vulnerable)

The main flight season ran from 24 June till 8 August (22 June-5 August). Only a single report outside this period, from Cley on 20 September. This is the first year since 2002 that there has not been a late brood at Holkham. Seen for the first time in Mousehold Heath, Norwich this year.

Red Admiral

A decline in sightings in the first half of the year was slightly mitigated by an improvement in the latter half. Overall records fell from 6% of all sightings in 2008 to 4% in 2009. A mating pair photographed at Holkham on 8 November is remarkably late. The highest count of 35 was at Scolt Head on 1 August when a widespread immigration of other species was taking place.

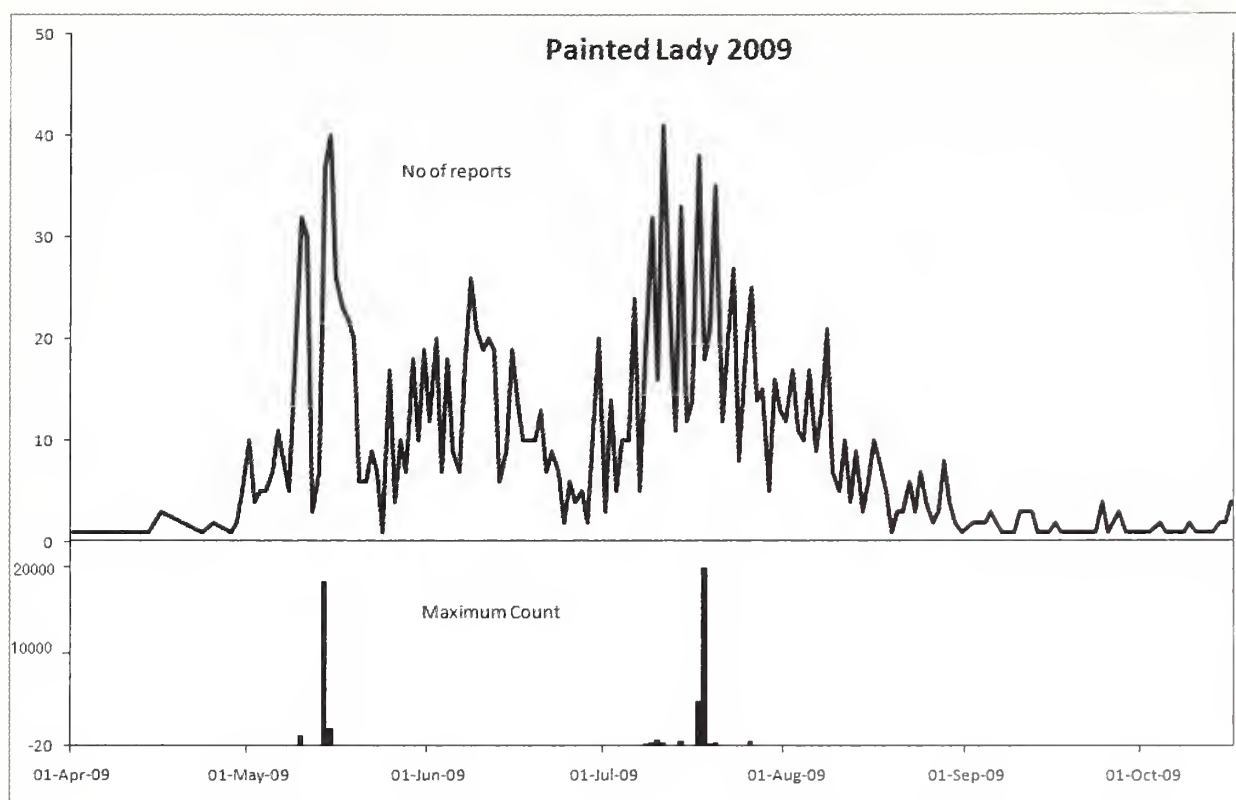


Figure 1. Occurrence of Painted Lady butterflies in Norfolk during 2009.

Seen continually from mid-March until 30 October, with few sightings outside this period. It has, however, been recorded historically from every month in the year.

Painted Lady

There were, in the end, two main migration events: one on the 23-29 May and a second wave on 31 July-1 August (Figure 1). This latter was mainly concentrated on the north coast, with maximum counts from Scolt Head. The earlier invasion involved three main waves: one across the north coast; one heading diagonally across the centre of the county; and the final moving up through TL98, TL70, TG70 and TG71. On the map (Figure 2) I have included reports of under 10 as 'x' to show how narrow the bands were – in effect they show where the migration was not (counts between 10 and 50 have been omitted). The widely expected boom in numbers of locally-bred insects in August does not appear to have occurred. A report of hundreds of pupae on Fishley Church was the only report of large numbers seen, although the rise in the number of reports after July 1 suggests some local emergence.

Small Tortoiseshell

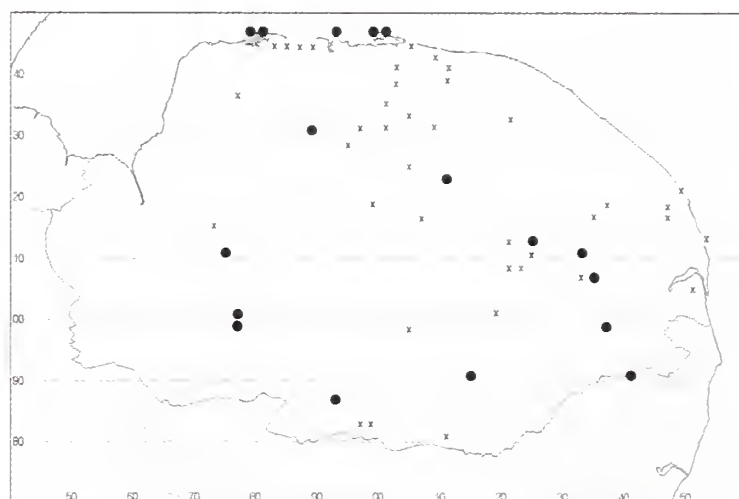
A small influx at Blakeney Point (211 on 19 August, 65 on 20 August) and Scolt Head

(100 plus on 31 July) was the only evidence of migration this year, but counts of 50 plus were widespread throughout the county. The cold winter seems to have helped survival rates, with this being the most common butterfly reported during March. Clearly last year's immigration helped boost the population, as other parts of the country continued to report very low numbers. A report of 'thousands' of caterpillars seen at a site near Holt holds promise of continued recovery.

Dark-Green Fritillary

A record on 15 June was exceptional, the main season running from 21 June till 9 August (16 June-11 August). Just five sightings

Figure 2. Painted Lady reports 23-25 May. Dots: counts above 50. Crosses: counts below 10.



between 16 August and 1 September. A count of 225 from Lodge Marsh on 2 July was remarkable, and the North Norfolk coast in general produced much higher counts than in previous years: 107 on 24 June and 87 on 7 July at Wells and many counts of 50 plus from Holkham. By contrast, fewer counts in excess of 100 than usual were reported from the dunes between Horsey Gap to Winterton, although it was still a common insect there on hot days.

Wall (Near Threatened)

Although a welcome improvement on last year, records remain above a line drawn from Titchwell to Lowestoft, with yet again no records received from the Brecks (although there were four sightings in Suffolk from TL68). First brood 6 May till 16 June, (5 May-13 June), second 19 July to 31 August (22 July-3 September). Two sightings between those dates: 1 and 13 July, and two after: 26 and 28 September, suggesting a partial third brood.

Marbled White

No sightings this year, but a belated report of one seen at East Ruston on 27 June 2001. One seen on the Cambridge/Suffolk border this year is indicative of this species' continued spread eastward. It remains our most likely new breeding species.

Grayling (Vulnerable)

Some welcome sightings from inland sites this year: Holt Lowes, Buxton Heath, Horstead, Tunstead, and Upton Fen. Also several from the southern edge of the county: nine tetrads in the STANTA area and one from near Bungay. Otherwise this remains a coastal butterfly, with the highest counts from Winterton and Blakeney. Flight period 14 June till 1 September (10 July-19 September)

Small Heath (Near Threatened)

The distribution remains firmly centred on the coast and the Brecks – at least as far as reports go. I suspect the species remains in more central areas, but is being overlooked.

A most remarkable individual was photographed this year at East Ruston, with three separate underwing aberrations: ab. *castanea* Leeds (coffee or dark brown between the base and the transverse stripe), plus ab. *anticrassipuncta* Leeds (apical spot on the underside of the forewings very large), plus a previously undescribed aberration (white lines either side of the apical spot). Flight period 9 May till 24 September (6 May-19 September).

Migrants

Camberwell Beauty

Only four reports received, probably only relating to three insects. Remarkably a report of a Camberwell Beauty in a garden in Bunwell on the 27 June at 1 pm was followed by a verbal report at the Norfolk Show of a sighting at a garden just 100 m away at 4 pm on the same day. Other sightings were Fritton Wood on 2 July and Martham on 5 July.

American Painted Lady

A sighting from Reepham TG1023 on 11 October. I note you can buy pupae of this species on ebay, but it has been reported as an immigrant before. Indeed the first UK report was in 1828, which rather pre-dates the internet.

Aberrations

In addition to the Small Heath reported above, a female Gatekeeper ab. *subalbida* Verity (synonym ab. *pallidus* Frohawk) was reported on 16 August at Hoe, Dereham and a Meadow Brown ab. *grisea-aurea* Oberthur on 14 July at Weybourne cliffs.

Reference

FOX, R., WARREN, M.S., & BRERETON, T.M. 2010. *A New Red List of British Butterflies, Species Status* 12: 1-32. Joint Nature Conservation Committee, Peterborough.

A Brazil, 68 Albany Road, Great Yarmouth, NR31 0EE.

Orthoptera

David Richmond

A cold winter led to fairly average emergence dates for nymphs. This was followed by a warm spring and hot summer, giving an excellent season for orthoptera. Those species which are expanding their range in Norfolk (Roesel's Bush-cricket, Long and Short-winged Conehead and Lesser Marsh Grasshopper) are now well established in suitable habitat over almost all of the county, and all were found in new 10km squares during 2009. Highlights of the year were the rediscovery of Mottled Grasshopper on Mousehold Heath, Norwich, and the discovery of Stripe-winged Grasshopper in three more new 10km squares in the north-west of the county.

Updated distribution maps for all species can be viewed under the 'species guides' section of the Society's website (www.nnns.org.uk)

Great Green Bush-cricket

Tettigonia viridissima (L.)

The small colony at Bradwell appears to have died out. Keith Knights first recorded this in 2005 in his market garden. Stridulating males were again heard in 2007, reflecting the two-year egg cycle, but none were heard in 2009.

Bog Bush-cricket

Metrioptera brachyptera (L.)

Martin Greenland has reported this species from the western end of Cawston Heath, representing a range expansion of the Marsham heath colony within tetrad TG1622.

Roesel's Bush-cricket

Metrioptera roeselii (Hagenbach)

Now well established in south Norfolk. A tour around the Saxlingham, Pulham and Gissing squares found it in nine new tetrads in a single day. It has also been found

at Hales and at Reedham, its easternmost sites to date. It does not yet seem to have penetrated to the Broads, there being only three tetrad records north and east of point TG200100.

Long-winged Conehead

Conocephalus discolor (Thunberg)

Now widespread across the county, including the Broads area, where there are records from dry, rough vegetation at Hickling, Salhouse and Hoveton. In the south-east of the county it was found in over twenty tetrads during the course of two visits covering TL18, 28, 29, 39 and 49.

Short-winged Conehead

Conocephalus dorsalis (Latreille)

The author was pleased to record a macropterous male (f. *burri*) on his home patch at Reepham and to have the opportunity to see how this differed from the now widespread Long-winged Conehead. The wings are more reddish-brown than Long-winged Conehead, and extend much further than the tip of the abdomen (though Long-winged Conehead also has a macropterous form). The body is a dark, oily emerald green colour, whereas Long-winged Conehead is less intensely coloured. The stridulation, heard through a bat detector while watching the insect, was the same alternating pattern of sounds as given by the normal short winged form (sometimes described as an alternating ticking and hissing sound). Long-winged Conehead has a continuous loud ticking sound without any modulation. Short-winged Conehead has expanded its range both nationally and locally in the 21st century, so the long winged form must be much more common than it used to be, thus permitting the colonisation of new areas. Flordon Common and

Booton Common are just two sites where Short-winged Conehead is now present, but where the author knows it was absent in the earlier years of the 21st century because the sites had been intensively searched with a bat detector in specific quests for this species. In early September, Short-winged Conehead was discovered in two tetrads along the River Waveney at Burgh St Peter (TM49). This is a new 10km square for the species, although in this instance this could reflect past under-recording rather than range expansion.

Stripe-winged Grasshopper

Stenobothrus lineatus (Panzer)

The Mousehold Heath colonies first reported last year are thriving, and in many parts of the Heath it was the dominant species in a July 2009 visit. It has also been found in new 10km squares at Dersingham Common (TF62), Holme (TF74) and Barwick/Walsingham (TF93) where it occurs in a disused railway cutting and on an embankment of the Wells-Walsingham narrow gauge railway. On a negative note it has probably been lost from the now cultivated areas of rough grass at Hockering playing fields where it was first reported in 2007.

Common Green Grasshopper

Omocestus viridulus (L.)

Tim Gardiner has reported this species from beneath power lines in Waveney Forest (TL40), a new 10km square.

Lesser Marsh Grasshopper

Chorthippus albomarginatus (De Geer)

There were new 10km square records for the Walsingham area (seven tetrads in TF93) and the Hempnall area (two tetrads in TM29).

Mottled Grasshopper

Myrmeleotettix maculatus (Thunberg)

The author was pleased to rediscover this insect on Mousehold Heath after a gap of many years. It occurs in an area of dry stony ground among sparse heather, where recent management work seems to have

enhanced its habitat.

Early and late dates

As mentioned in the introduction, there were no particularly early dates for the spring emergence, but a mild autumn brought the usual crop of late dates. 22 October was the author's latest ever date for Meadow Grasshopper, while Field Grasshopper survived until 15 November on a south-facing bank at Reepham. Long-winged Conehead survived until 4 November (the latest Norfolk date), as did Dark Bush-cricket (although for that species this is a rather early last date). Speckled Bush-cricket was again the latest survivor of the year, lasting until 1 December in scrub at Reepham. This is the third time in the last four years that this species has survived into December.

DI Richmond 42 Richmond Rise,
Reepham, Norfolk NR10 4LS

Bumblebees

David Richmond

The last bumblebee report was published two years ago, so this account covers new records for the period 2008 and 2009 (plus some late records for 2007).

I am grateful to Nick Owens for his work in North Norfolk, and to all other observers who have submitted records from around the county. Despite the popularity of the group, most species remain under-recorded. This is particularly the case for the difficult-to-identify cuckoo bees. For an up-to-date account of all species, please see the 'species guides' section of the Society's website (www.nnns.org.uk)

Bombus jonellus This species was recorded from seven tetrads over the last two years, including new sites at Holkham and Cley. Other sites were Weybourne, Kelling Heath, Beeston Common (two tetrads) and Catfield Fen. There have been no recent records from the inland heaths where it was reported in the mid-20th century.

Bombus monticola Nick Owens secured the fourth county record for this species when he photographed a male on Kelling Heath in September 2009. The three previous records, also males, were on Scolt Head in 2007.

Bombus hypnorum The first county record of this recent colonist was at Earlham Cemetery in Norwich in June 2008. The finder, Stuart Paston, found it again in a nearby garden in May 2009, since when there have been reports from Shotesham, Beeston Common, Kelling Heath and Holkham Beach. This species, sometimes referred to as the Tree Bumblebee because of its habit of building nests in the open, is expected to spread rapidly and recorders are asked to watch out for it anywhere in the county. It is uniquely identified by its ginger thorax

and prominent white tip to the abdomen.

Bombus hortorum The author observed a queen with full pollen sacks on the late date of 12th October 2009, possibly indicative of an unusual second brood.

Bombus ruderatus Reported by Patrick Saunders from herb-rich field margins to the south-west of Burnham Market in 2007, a new 10km square and only the second record in the 21st century.

Bombus ruderarius Stuart Paston found a dead individual in Earlham Cemetery, Norwich, on the early date of 16th March 2009 (identification confirmed by Tony Irwin).

Bombus muscorum The main stronghold of this species remains Scolt Head Island, where Ash Murray reported a thriving colony in 2003. A little to the south, Patrick Saunders reported it from a new tetrad on herb-rich grassland near Burnham Market in 2007. In 2009 it was recorded by the author on Cley East Bank (photograph confirmed by Tony Irwin) and by Nick Owens at Weybourne (both new tetrad records).

Bombus bohemicus (cuckoo of *B.lucorum*) There were four widely scattered records of this difficult-to-identify cuckoo bee. Tim Strudwick reported it from Norwich Rosary Cemetery in 2008, while in 2009 Nick Owens found it in the Stanford Training Area, at How Hill Broads and at Beeston Common. The first three of these records are new 10km squares.

Bombus rupestris (cuckoo of *B.lapidarius*) There were four new records for this red-tailed cuckoo bee over the last two years, all by Nick Owens, at Holkham, Muckleburgh Hill, Weybourne and Beeston Common.

Bombus barbutellus (cuckoo of *B.hortorum*)

Reported by Nick Owens from a new 10km square at Holkham in 2009.

Bombus campestris (cuckoo of *B.pascuorum*)

Reported by Tim Strudwick from Caister Dunes in 2007, by the author at Reepham in 2008 (on Scabious), and by Nick Owens at Holkham in 2009 (on Red Clover), all new 10km square records.

Bombus sylvestris (cuckoo of *B.pratorum*)

Reported by Nick Owens from Holkham (a new 10km square record) and by Francis Farrow from Beeston Common (a first record for that site).

DI Richmond 42 Richmond Rise,
Reepham, Norfolk NR10 4LS

Vascular plants

Bob Ellis

This report will focus on threatened plants that were recorded during 2009 in 'new' tetrads since the survey work for *A Flora of Norfolk* was completed in 1998.

Many of the species involved are arable weeds, or at least species of cultivated or disturbed ground. These are often intermittent in their appearance, perhaps surviving unseen for many years in the seed bank and only appearing when conditions change in their favour. Many aquatic plants, particularly those growing in ditches and dykes, have a similar strategy.

Species classified as Endangered on the Red List

Corn Chamomile *Anthemis arvensis*: 3 tetrads.

TF73F, Dersingham, Simon Harrap; TF82J and TF82N, West Rudham, Flora Group, both on arable margins. It is probable that Corn Chamomile is sometimes introduced with seed mixes, but these instances are probably from the seed bank on the well-drained, rather chalky soils of the area.

Purple Milk-vetch *Astragalus danicus*: 1 tetrad.

TL98S, West Harling Forest, Flora Group, 100s of plants scattered throughout a replanted area. This is an eastward extension of its recent range but it was recorded from an adjacent tetrad by C.P. Petch in 1979.

Small-flowered Catchfly *Silene gallica*: 3 tetrads.

TG40S (Salhouse, Martin Woodcock); TG11Y (Horsford, Flora Group); TG21N (Frettenham, Bob Leaney). The Salhouse record represents a welcome return of this plant to the arable habitat, occurring in an uncropped cultivated margin. The Horsford record was a single casual plant on a disturbed roadside, but suggests it may

still be present in the area. The Frettenham record was a roadside verge with around 100 plants.

Narrow-fruited Cornsalad *Valeriana dentata*: 1 tetrad.

TF82I (West Rudham, Flora Group, in barley stubble).

Species classified as Vulnerable on the Red List

Rye Brome *Bromus secalinus*: 5 tetrads.

TF41L (Leverington, Flora Group); TL72I (Flitcham, Ken and Gillian Beckett); TM19T (Forncett), TM39T (Loddon) & TM49M (Toft Monks), by the author. These records seem to agree with a national trend of resurgence.

Good-King-Henry *Chenopodium bonus-henricus*: 2 tetrads.

TG26 Kirby Bedon, the author; TM19Y, Flordon Common, NNNS Research Group. The first of these was a small group of plants on a roadside verge. The second is a fairly large colony and has possibly been extant ever since it was recorded by Burrell & Clarke in 1909.

Dodder *Cuscuta epithymum*: 1 tetrad.

TG32P, Bryant's Heath, Flora Group. On a small part of the heath that just 'clips' this tetrad. It has been known from the heath in the adjacent tetrad for many years.

Fine-leaved Fumitory *Fumaria parviflora*

1 tetrad. TF83C, Barmer, Mike Padfield. An extension to its recent range, on similar soils.

Frogbit *Hydrocharis morsus-ranae*: 4 tetrads.

TG32N, East Ruston; TL59H & TL59M, Welney Washes; TL99I, Thompson Common; all recorded by the Flora Group. This plant is something of a Broadland speciality although there are historical records for the Fens and other parts of the county. It is also

most probably occasionally deliberately introduced and it is not possible to be sure whether or not these records are the result of natural dispersal.

Henbane *Hyoscyamus niger*: 1 tetrad. TL98V, Garboldisham, Tim Holt-Wilson. Henbane is notoriously sporadic in its occurrence, though it can occur at the same site for many years.

Bur Medick *Medicago minima*: 1 tetrad. TL98S, West Harling Forest, Flora Group. Bur Medick is less frequent in this eastern part of Breckland than it is in the central areas. Perhaps it appeared here following forestry clearance.

Weasel's-snout *Misopates orontium*: 1 tetrad. TG23S, Southrepps, Mary Ghullam and the author. Two plants in a field of wheat.

Whorled Water-milfoil *Myriophyllum verticillatum*. 1 tetrad. TG32Q, Catfield, Flora Group.

Cat-mint *Nepeta cataria*: 1 tetrad. TF81H, Castle Acre, Ken and Gillian Beckett.

Tubular Water-dropwort *Oenanthe fistulosa*: 1 tetrad. TG03Y, Holt Lowes, Flora Group.

Prickly Poppy *Papaver argemone*. 1 tetrad. TF73N, Docking, Ken and Gillian Beckett, in a roadside grup (foot-drain).

Night-flowering Catchfly *Silene noctiflora*: 13 tetrads.

East Anglia is a stronghold for Night-flowering Catchfly and 2009 seems to have been a particularly good year for this predominantly arable plant.

Corn Spurrey *Spergula arvensis*: 9 tetrads.

Marsh Stitchwort *Stellaria palustris*. 1 tetrad. TL59M, Welney Washes, Flora Group. Rather surprisingly, this is also a 'new' 10Km square.

Other records

As ever, there are far too many other records of interest from 2009 to include in a report

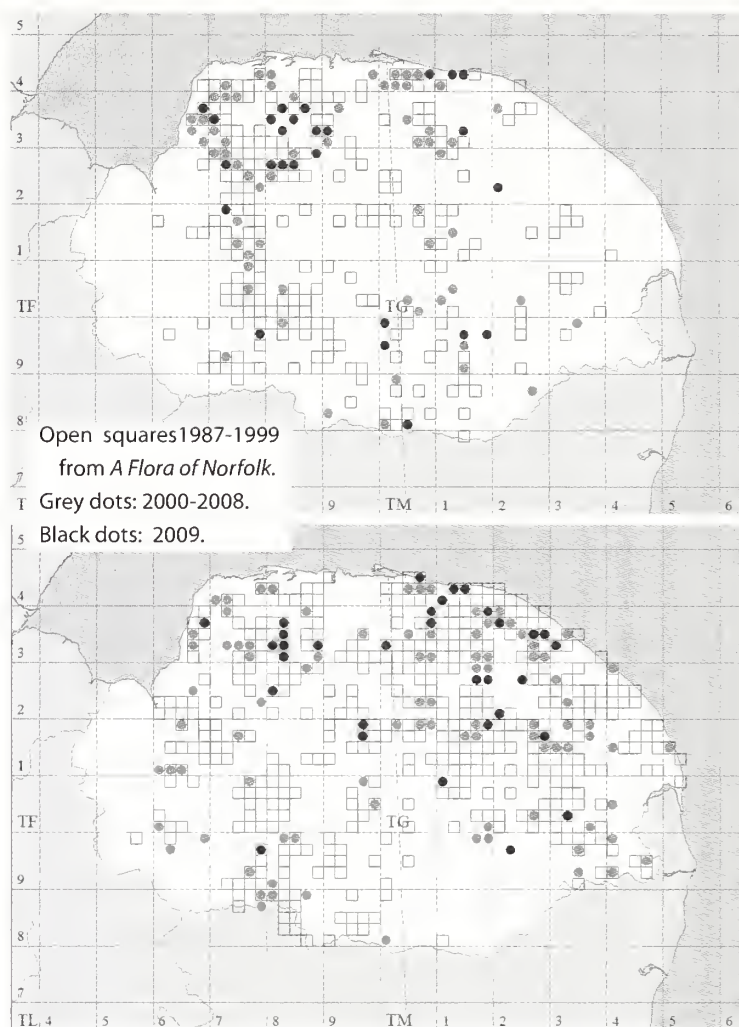


Figure 1. Distributions of Night-flowering Catchfly *Silene noctiflora* (upper) and Corn Spurrey *Spergula arvensis* (lower) in Norfolk.

such as this, but I would single out two as particularly worthy of mention. Alec Bull found a previously unknown colony of **Green-flowered Helleborine** *Epipactis phyllanthes* in Honingham – one of only seven recent sites in the county and a new 10Km square. Frances Schumann discovered **Abyssinian Mustard** *Crambe hispanica* in Congham (TF72), a first record for the county. This plant is now occasionally grown as an industrial oilseed crop (Stace 2010) and may well begin to appear elsewhere as a casual weed.

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RW Ellis 11 Havelock Road, Norwich NR2 3HQ

Fungi

Tony Leech

Despite the lack of rain, which reduced fungal diversity well into October, 2009 was a surprisingly good year for the Rooting Bolete *Boletus radicans*, a large and irregular bolete found under oak. The three new sites (Hunstanton, TF7341, 22.9.09; Briston, TG0630, 24.9.09; Holt, TG0839, 18.10.09) doubled the number of Norfolk records. Devil's Bolete *Boletus satanas*, reputedly the only seriously poisonous member of the genus, was found by Darren Frohawk at its second Norfolk site, near Hunstanton (TF7341, 22.9.09).

Since its appearance in Norfolk in 2001 (Leech *et al.* 2008) *Gymnopilus dilepis* has become increasingly common on woodchips both here and throughout the country. The yellow variant, noted by Rees (2004) in her description of this genus in Australia, and subsequently recorded in Britain, was found by Tom Bolderstone, together with the normal purple form, at Dersingham Bog (TF6628, 20.8.2009).

Second British record

One of the benefits of teaching fungus identification classes is that it widens the net of those who gather interesting specimens, which is how I received a large (11 cm diameter) mushroom with a dense covering of wine-red fibrils and very strongly yellowing flesh. Michelle Hoare had found a clump of them pushing up (and still almost subterranean) in grassland near willow trees at Whitlingham Broad (TG2507, 18.10.09) on the south-eastern outskirts of Norwich. Superficially they resembled the mushroom *Agaricus porphyron* but were clearly not this species. I was puzzled but Michelle, with the enthusiasm of the novice, found a matching picture on the Internet and I was able to confirm from the unusual branched and knobby cheilocystidia (cells

on the gill-edge) that her identification of *Allopsalliota geesterani* was indeed correct. The only other British record is from Potteric Carr in Yorkshire where it was first found in 2004 by Caroline Hobart (2005).

Another student on the course, Elena Whittaker-Slark, found the first Norfolk *Paxillus rubicundulus* at Horstead Mill (TG2619, 2.10.09). Although a specimen was not taken, her photograph and the habitat, under Alder *Alnus glutinosa*, clearly indicated this species, a scaly 'version' of the familiar Brown Rollrim *Paxillus involutus*.

A mouldy grasshopper

Kerry Robinson, an amateur mycologist from Baldock, kindly sends me a list of her best finds when she visits Norfolk. When she came across a dead grasshopper on a heather stem at Winterton Dunes (TG 4721, 25.6.09) she realised that it was the victim of a parasitic fungus which she identified as *Entomophaga grylli*, a determination confirmed by Dr Brian Spooner at Kew as only the third British record for the species. This is one of a number of insect-infecting fungi which subvert their hosts' behaviour causing the insect to ascend vegetation before it dies and so improve dispersal of the spores.

Two more truffles new to Norfolk

The excitement of finding the truffle *Tuber macrosporum* in the county in 2008 has been followed by the addition of two more species of the genus to the county list. When I mentioned to Robert Maidstone that not even the highly esteemed Summer Truffle *T. aestivum* had been recorded in Norfolk he told me he came across them quite often, and within a month he had collected a specimen from Tibbenham (TM1488, 9.7.09) – from under Laurel *Prunus laurocerasus*.

Less than a month later Sue Flaxman unearthed several *Tuber maculatum* at a depth of about 5 cm while extending her vegetable patch near Loddon (TM3998, 29.7.09). The nearest tree was White Poplar *Populus albus* with Holly *Ilex aquifolium* a little further away. For the latter truffle there are about 15 records on the national database.

Strange mushrooms

It is well known that the Yellow-staining Mushroom *Agaricus xanthodermus* causes disturbing symptoms in most people who eat it, so when a woman rang to tell me that she and her husband had been very ill (for five days) after a mushroom meal, I suspected that species. However, when she brought me fresh specimens it was apparent that they were not *A. xanthodermus*. They showed no sign of yellowing, had no strong smell, but possessed a fragile ring and rhizoids. Despite lacking scales on the cap they appeared to be close to *A. bresadolanus* /*A. romagnesii*, species which are considered to be a single entity in Britain (recorded under the first name) but are distinguished by continental authors. Intriguingly, both Cappelli (1984) and Courtecuisse *et al.* (1995) note that *A. romagnesii* is, or may be, poisonous whereas *A. bresadolanus* is considered edible! The mushrooms were found at Cley (TG0443, 13.11.09) but a very similar mushroom, which I had tentatively ascribed to *A. bresadolanus* as a new county record' had been found earlier in the year by Sue Rees in a garden at Dersingham (TF6830, 6.8.09). It is noted by Geoffrey Kibby in his unpublished key to British species of *Agaricus* that *A. bresadolanus* is rarely found 'in the wild' and is almost always in gardens.

Yellow sand dunes would appear to be an unlikely habitat for fleshy fungi but several species are restricted to them. Amongst these is a species of true mushroom, *Agaricus devoniensis* which can be found almost buried in sand quite commonly along the Norfolk coast, although there are relatively few national records. Ex-

amination of a specimen of from Blakeney Point (TG0046, 1.12.09), however, revealed unusually large and variable spore lengths, ranging from 8.0 to 20.0 micrometres (μm); the expected range is 5.0-7.5 μm . The explanation came from observing that the basidia, gill-surface cells normally bearing four spores each, bore only two spores (occasionally one or three). A number of fungus species have 2-spored variants, considered by some to constitute separate species but the phenomenon does not appear to have been recorded in this species.

A true species with 2-spored basidia is *Laccaria fraterna* which closely resembles the widespread and variable Deceiver *L. laccata* but which is always under *Eucalyptus* spp. – so clearly non-native. It has been found widely in Britain but not in Norfolk until a neighbour in Holt (TG0839, 27.11.09) asked me to reassure him that that the toadstools on his lawn were harmless to both him and the surrounding trees. As so often happens with fungal finds the same species turned up a day later, in very large numbers, under two eucalyptus trees in Holt Cemetery.

An interesting association

Many of the larger fungi (for example, brittlegills, milkcaps and boletes) form mycorrhizal associations with woody plants which are mutually beneficial. These links are obligatory so that when such a fungus is found, the tree or shrub will not be far away. It was therefore a surprise to find a webcap (*Cortinarius* sp.) on the dunes at Blakeney Point (TG0046, 1.12.09) remote from any apparently suitable mycorrhizal partner. *Cortinarius* species of the *Dermocybe* group are notoriously difficult to identify but I tentatively named the find as *Cortinarius croceus*. Very soon afterwards I read a report (2009) by Peter Roberts (a recently retired mycologist from the Royal Botanic Gardens, Kew) that several species this group had been recorded growing in apparent association with species of sedge (*Carex* spp.). Although neither *Cortinarius croceus* nor Sand Sedge *Carex arenaria* (the

only sedge in the vicinity) were specifically mentioned, it would be interesting to investigate this further.

Novel pale ones

The prefix 'leuco-' means white and has been used in the name of several genera of white-spored toadstools which are in other ways similar to dark-spored species. Thus *Leucocoprinus* resemble *Coprinus* (inkcaps), and *Leucoagaricus* resemble *Agaricus* (mushrooms). Together with the genus *Lepiota* (into which most of these were formerly placed) there are some 80 species in Britain. Despite most being large and with distinctive characteristics the majority of these fungi are nationally scarce with fewer than half occurring in Norfolk. Jonathan Revett has now added two more to the list. The first was *Leucoagaricus meleagris* from Foxley Wood, (TG0422, 2.10.09) where there were two large groups (50+ fruitbodies) growing on a huge year-old pile of woodchips which had considerable underlying warmth when the top level was excavated (see photo p. xx). The abundance and habit are consistent with its probable status as a semi-naturalised alien. The specimens discoloured deeply and blackened on handling, which is typical of the genus.

The second find was *Lepiota ignivolva* at Two Mile Bottom (TL8487, 7.11.09). This robust fungus (see photo p. xx) is characterised by a ring with a distinct dark edge, a stem base which can slowly redden and a habitat preference for soil with underlying chalk or limestone.

New Norfolk records

In addition to the above, nine species were added to the Norfolk list in 2009; four of them from Flordon Common (TM1797) in connection with the Society's research which is reported elsewhere in this volume:

Cortinarius alnetorum A webcap under Alder *Alnus glutinosa* (Alec Bull, 4.11.09).

Microbotryrium stellariae On the anthers of Water Chickweed *Myosoton aquaticum* (ARL, 28.9.09). This

would previously have been recorded as Violet Anther Smut *Ustilago violacea* s.l. but the species has been split.

Pluteus griseoluridus An agaric, on wood fragments (ARL, 28.9.09).

Sphaerotheca epilobii Powdery mildew on Greater Willowherb *Epilobium hirsutum* (ARL, 28.9.09).

The remaining records were:

Campanella caesia A small greyish oysterling-like fungus (but not closely related) on the dead leaves beneath clumps of Marram *Arenaria ammophila*, found by Martyn Ainsworth at Gun Hill (TF8445, 30.10.09).

Hohenbuehelia tremula Found by Karl Charters on woodchips at Roydon Common (TF6822, 13.8.09).

Hygrocybe glutinipes On a lawn at Brinton Hall (TG0335, 2.8.09) by ARL.

Hygrocybe vitellina Under bracken at Spout Hills, Holt (TG0738, 29.8.09) by ARL.

Podospora pleiospora On Rabbit dung at Dersingham Bog (TF6628, dung collected 20.8.09) by ARL.

Acknowledgements

I am grateful to all who send me records of fungi, common or rare and especially to all those mentioned above.

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AR Leech 3 Eccles Road, Holt, Norfolk NR25 6HJ.

Obituary

Ken Durrant 1920 – 2010

Ken Durrant FRES died on 28 April 2010, aged 89, a few weeks short of his 90th birthday. Ken was a man respected in many fields, including his work as a JP, in Scouting, as an International Cage Bird judge and as a cactus enthusiast (to name a few). In the field of Norfolk's natural history, however, he became one of the county's finest naturalists. For over 80 years Ken's fascination with the natural world was a major part of his life. Even in his late 80s his great love and enthusiasm for the subject, particularly for insects, had not diminished. His cheerful boyish enthusiasm was not lost on those, young or old, who encountered Ken in full swing, whether on a guided walk, at an illustrated talk or through his writing.

Ken often recalled that his natural history awakening came when watching cockroaches on a Cromer bakehouse floor whilst still a toddler. Brought up in Cromer during the 1920s and 30s he came into contact with the naturalist Alfred Savin, who guided the young Ken through the natural world. It was a time of cycle rides to places of interest, such as Beeston Regis Common, Overstrand cliffs and Kelling Heath. It was soon apparent, however, that master and pupil were not of the same mould. Alfred Savin, a great local naturalist of the Victorian school, would be looking for the perfect specimen, such as a pristine moth hatched from a collected pupa, and anything that obviously contained parasites was rejected. The young Ken, however, picked these up and bred out the resulting insects. In doing so it opened another window on to the fascinating world of nature. Ken moved on to collect and study many such parasites including

those that form plant galls. During these observations Ken noted that not all the insects that hatched out were parasites, some (known as inquilines) were using the structure of the gall as a home only and had no effect on the host directly. Good reference works were scarce and expensive so many specimens were sent to the Natural History Museum in London where the entomologists of the day were happy to receive and answer enquires from a Cromer schoolboy. As his enthusiasm grew he copied out many reference works by hand and even taught himself to read German in order to take advantage of the better keys produced on the continent.

The years of the Second World War were dramatic times for a generation and Ken served in the Royal Corp of Signals having become a telephone engineer prior to hostilities. Life still continued and in 1941 Ken met Isobel, whom he married in 1944 and who remained his companion for over 70 years. Insects, however, were never far away and the army, quick to pick up on anything out of the ordinary, nicknamed him 'Bugsy'. Due to his telecommunication skills Ken found himself in many theatres of war - Europe, India and Burma among others. His tale of crossing the channel during the D-day landings and watching a migration of Hummingbird Hawkmoths heading in the opposite direction, or getting local tribesmen to bring him insects from the forest in the remote highland jungles of Burma shows that opportunities for study are always open to those with a passion for their subject.

After the war Ken and Isobel set up home in Dereham, where they had five

children. The extended family is such that at one time Ken quipped that he now had enough grandchildren to form a football team. Whilst in Dereham, Ken became very active within the Norfolk and Norwich Naturalists' Society, to which he had been elected as a member in 1949. His first talk to the Society was on 18 November 1950, the subject being 'Methods of collecting and preserving insects'. Ken first became a Council member on 21 April 1951 and in 1958 his first paper appeared in *Transactions*. He went on to become an elder statesman of the Society and as a vice-president took an active role on the Council, while as a guest speaker his final appearance was in October 2009. Ken held the position of the Society's president twice, in 1960-61 and again 1990-91. Also in 1991 Ken was awarded the Sydney Long Medal, given jointly with the Norfolk Wildlife Trust, for services to the conservation of Norfolk's wildlife. Over the last few years Ken provided for the Society's *Transactions* detailed notes and beautiful illustrations of many lesser-known groups of insects from his personal Norfolk perspective, and these will be an inspiration to generations to come.

While living at Dereham Ken took on the responsibility of Scarning Fen and as its honorary warden provided care and protection to some of the county's rarest insects. Whilst travelling Norfolk's roads as a telecommunications engineer he had had many opportunities to observe and collect throughout the county, creating a reference collection that would be the envy of many a museum (and shortly before his death Ken generously donated this vast collection to the Castle Museum). Ken had also met a great many people on his travels within the county and through his genial personality and enthusiasm managed to put many a suspicious landowner under his

spell and gain permissions to forage in far-flung corners of closed estates. Such meetings stood Ken in good favour over many years and he was often asked back to places from which others were barred. At exhibitions and open days, Ken would often be seen surrounded by people, to whom he dispensed advice and answers to the many questions, however inane and unscientific. He was elected a fellow of the Royal Entomological Society in 1960, which he considered a great honour.

In the mid-1960s the then Norfolk Youth Service, under an initiative of Andrew Piersennè, organised a weekend at Wensum Lodge in Norwich for young people interested in natural history. The event drew students and young working people from all over the county and culminated in a group known as the 'Norfolk Young Naturalists', a body of young people that continued for almost 25 years. Ken was one of the line-up of eminent Norfolk naturalists that took part in that weekend. As always immaculately dressed in suit and NNNS tie he delivered a talk that fascinated and enthralled the audience - an insight into the life of *Lipara lucens*, a small fly that creates the distinctive 'cigar gall' on the stem of Common Reed - and this has remained an unforgettable highlight of that afternoon. His introduction of a subject that many may dismiss was made memorable by the enthusiasm and passion of its delivery, not in a 'fire and brimstone' sense but through knowledge and a thorough understanding of the subject. Ken continued his association with NYN as one of its advisors and as such encouraged many young 'nats', including one west Norfolk member that hitchhiked to Ken's house with a box of misshapen acorns; these turned out to be knopper galls - the first record for Norfolk.

In his later working life Ken became a BT manager and completed a full circle by returning to look after the Cromer exchange; he settled with his family, however, in Sheringham. After retiring, the early stamping ground of Beeston Regis Common became a great part of his life again with the formation of the Beeston Common Management Group in 1983. Sheringham Town Council appointed Ken as honorary warden (a post he held for over 22 years) and under his leadership the common was transformed from a scrub-dominated area to a mosaic of habitats that 'lost' plants and insects were once again able to re-colonise. Such was the transformation of the common that English Nature presented the BCMG with an SSSI award in 1996 – a first for Norfolk. One of the early tasks tackled by BCGM was the restoration of the Newt Pond as a permanent water body and in the 27 years that it has now existed it has attracted twelve species of dragonfly, of which ten have bred. The latest arrival was the Small Red-eyed Damselfly, which first turned up in Norfolk in 2001 and appeared on the common in 2002. The main problem with wetlands in recent years is both the lack of groundwater and its quality, due in part to extraction and nutrient-rich 'run-

off'. The problem is currently on-going at Beeston Regis Common and Ken, when warden, supplied vital water level data from a dip well, taking the readings regularly once a week. He also contributed significantly to several debates with the invaluable historical knowledge of someone who had known the area longer and more intimately than possibly any other individual living at the time.

Whilst Ken was warden many groups of people benefited from his talks and more especially his walks as he extolled the virtues of field natural history with humorous comment. Thanks to a virtually photographic memory the insects and plants encountered were not only named but incisive insights into folklore, life histories and relationships were given. Ken was truly an all round naturalist and after greeting you with a cheery "What ho! led many a novice and expert alike into the fascinating and at times fantastic world of nature. His life was one of great achievement and much of it was spent in sharing his many gifts with others, especially that knowledge of his beloved insects.

Francis JL Farrow

Obituary

Richard Hamond 1930 – 2010

Dick Hamond died suddenly of heart failure on 22 July 2010 at his home, Scaldbeck House, Morston, Norfolk. His family has long been associated with the Norfolk and Norwich Naturalists' Society, and he was a greatly valued member, having joined in 1949 and being elected as President for 2001-2002.

Dick was born in Norwich on 26 January 1930. His father was a distinguished soldier, Major Philip Hamond DSO, MC, who with his wife Diana encouraged their elder son in his studies of marine life, which were commenced as a school-boy in 1945 at the early age of 15 years, when Dick began to develop his life-

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long passion for research on the Norfolk marine fauna. He was later to earn the degrees of BSc in 1959 and PhD in 1967 from the University of London, and soon after receiving his doctorate left Norfolk to take up employment in Australia.

His ill-fated BOAC flight 712 from Heathrow in 1968 famously lasted only three and a half minutes due to a disastrous fire in an engine that quickly broke away, coolly photographed by Dick from his seat over the wing. Sadly, five lives were lost in the inferno that totally destroyed the aircraft after an emergency landing, but Dick survived unscathed and some of his photographs may be seen in the book *Fire over Heathrow* by Susan Ottaway (2008).

The Australia years were spent first in the service of the Commonwealth Scientific and Industrial Research Organisation, and later as an Associate Research Fellow in the Zoology Department of the University of Melbourne. During this period, Dick travelled widely in Australia and New Zealand, discovering many previously unknown marine invertebrates, which included specimens representing a new genus and a new family of copepod Crustacea that he generously donated to another taxonomist for description and naming. In the end, Dick himself named at least another four new genera and forty species of animals, almost all of them copepods.

After returning to Norfolk in 1985, he continued his plankton-netting and dredging trips far out to sea from Morston in his crab-boat the *Orion*, and also hosted occasional visits of amateur naturalists to the rocky shore at West Runton. In addition, Dick could always be called upon to identify and record marine invertebrates and fish for naturalists in East Anglia and way beyond. However, his attention later turned more

and more towards the development of low-cost techniques for improving the performance of microscopes and methods for the rapid production of accurate drawings of his favourite animals, the amazingly complex copepods. His great skill and experience in this field contributed enormously to the success of the society's Microscopy Group.

Dick will be remembered, not only in Norfolk but all over the world, for his unstinting willingness to share his wide knowledge of marine life and microscope technology, and for his great sense of fun that made him the focus of attention at any gathering of scientists or friends. The high regard in which Dick will always be held by fellow zoologists is borne out by the large number of taxa named in his honour, including nine species, one genus, and one family.

This short tribute corrects some of the minor errors in previous accounts; a more detailed biographical memoir will be published in the next issue of the Transactions.

RB Williams

Previous obituaries

Dr Richard Hamond - a brief record. *Funeral order of service*, 4 August 2010 (M Athill).

Obituary. Dr Richard Hamond. Scientist caught drama of aeroplane fire on camera. *Eastern Daily Press*, 5 August 2010 (M Pollitt).

Dr Richard Hamond 1930-2010. *Norfolk Natterjack*, no. 110, 12 August 2010 (AR Leech).

Obituary

Keith Clarke 1924 – 2010

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It was with great sadness that we heard in the summer of the passing, after a short illness, of Keith Clarke. I first met Keith when I took on the role of Secretary of the Society in the late 1960s. The committee used to meet in the Assembly Rooms three times a year and, whilst small in numbers, it included the great names of 20th century natural history in the county. Ted Ellis, Eric Swann, Charles Petch, Michael Seago, Don Dorling and Ernest Daniels. Keith was the Minute Secretary. He used to present me with the minutes of the meeting on arrival and just told me to add the apologies. As he said he knew them all and he knew what they would say. He carried on doing this for the next seventeen years! Committee meetings in those days were concerned with talking about natural history.

Keith was an outstanding scientist within his speciality of the small creatures known as diatoms. He published many papers on the group and discovered a number of species new to science. As Keith said "the study of diatoms requires good eyesight, a deep knowledge of German and a strange fixation which grows with age". His slide collection will be housed in the Natural History Museum in London.

Being an algal expert has its benefits. One needs a bottle to collect a sample of water quickly in the field before scurrying off to the warmth of the car prior to using a heated laboratory to identify the diatoms. Keith had worked out this effective method of study on winter days when the north wind cuts across Norfolk. To add to his cunning he attached the bottle to a long metal rod so that he did not even have to bend to collect water. At Potter Heigham this strategy

came unstuck when he touched an electric fence with the metal rod causing him to do a merry clog dance.

Keith Clarke was a founding Trustee of the Ted Ellis Trust where his expertise provided the blueprint for the management of Wheatfen and the direction for future research. He possessed that rare quality of 'feeling for the countryside' and Wheatfen is testament to his vision where people are invited to wander through the reed beds, lokes, woods and dykes to enjoy and share this unique part of Norfolk.

Keith Clarke was both President and Honorary Vice-President of this Society. He served for many years as a Council Member of the Freshwater Biological Association and on a number of committees of the Broads Authority. He was a visiting lecturer at the School of Environmental Sciences at UEA where he gathered together a number of colleagues to study diatoms.

For the last three decades Ken Durrant, Derek Howlett and I joined with Keith to survey and study the natural history of Norfolk. In one year we surveyed the Battle Area, the River Nar, the River Stiffkey with Lord and Lady Buxton, and we spent time tracing the history of Seamere through cores in the mere silts. As each year started we found new sites to explore but alas only Derek and I remain. We will miss our dear friend Keith. This gentle man whose warmth and humour has guided us across the length and breadth of Norfolk. We are left with our memories and these we will cherish for the future. Goodbye dear friend as you go gently into the night.

Roy Baker

FLORDON COMMON

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Scirpus sylvaticus Wood Club-rush

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Cover: **Southern Marsh Orchid** *Dactylorhiza praetermissa* at Flordon Common. *Photo:* Peter Aspinall.

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